REHAU®

Unlimited Polymer Solutions

REHAU INTELLIGENT FS/FC HEATING/COOLING CONTROLS

TECHNICAL & INSTALLATION MANUAL

REHAU INTELLIGENT FLOOR HEATING/COOLING CONTROLS

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If a floor heating system is added to an existing heating or hot water system, containing mild steel pipes, a strainer must be fitted straight after the branch off.

All REHAU control systems must be installed:

- By a competent person
- In accordance with the latest issue of instructions supplied with each component
- According to the current IEE wiring regulations laid out in BS 7671 and National Valid regulations and in compliance with the ordinances stipulated by local power authorities.

Diagram/DWG Legend

AC	Actuator	**VT**	Variable Temperature
AV	Air Vent	**MV**	Motor Operated Mixing Valve
BPV	Bypass Valve	**RS**	Room Sensor
BV	Balancing Valve	**BC**	Boiler Controls
CP	Circulating Pump	**SP**	System Pump
CS	Cylinder Sensor	**TA**	Standard Sensor
CT2	Programmable Room Sensor	**TD**	Room Sensor with identical features of TM, along with floor sensor
OS	Outside Sensor		
CYL	Cylinder	**TIV**	Thermostatic Inlet Valve
DHWS	Domestic Hot Water System	**TM**	Room Sensor with four modes Auto, Day, Night and Frost protection
EV	Expansion Vessel		
FM	Flow Meter	**TMV**	Thermostatic Mixing Valve
HLS	High Temperature Limit Stat	**TP**	Tamper Resistant Sensor
IV	Isolating Valve	**TRV**	Thermostatic Radiator Valve
LSV	Radiator Lock Shield Valve	**ZV**	2-port Zone Valve

Technical Data

Power Supply	230V AC +10/-15%, 50 HZ
Max load pumps and Thermal actuators	4A + 35VA
Boiler relay	Volt free signal. Max 4A
Main pump (Volt free relay)	Volt free signal. Max 4A
Secondary pump	230V AC, 50Hz Max. 4A
Thermal actuators	Max. 10VA on each output. Max. 35VA in total
Max. 10VA per output. Max. 35VA in total	
Optional External Switch (Timer) for night setback	Open terminals for night set back and closed terminals for day operation
Room sensor Bus 2 wire low voltage	5v
Application sensor and Limit sensor	NTC type ETF-1899A for water temperature
Control signal for mixing valve actuator	0-10V DC
Power supply for mixing valve actuator	24V AC. Max 6VA

1.0 PRINCIPLES OF UNDERFLOOR HEATING/COOLING

1.1 PRINCIPLE OF UFH

Thermal Comfort

REHAU underfloor heating system operates on the basis of low surface temperatures and even temperature distribution across the whole floor with comfortable radiant energy. In contrast to other heating systems the radiative equilibrium between occupants and the surfaces in a room is established and an optimum level of comfort is achieved.

Energy-saving

Due to the REHAU underfloor heating systems' high proportion of radiant energy, comfort conditions can be achieved with lower room temperatures typically 1ºC to 2ºC. This facilitates a typical annual energy savings of 6% to 12%.

Environmentally friendly

Due to the high heat output, even at low flow temperatures, the REHAU sub-surface heating systems are ideal for use in combination with gas condensing boilers, ground source heat pumps or thermal solar power systems.

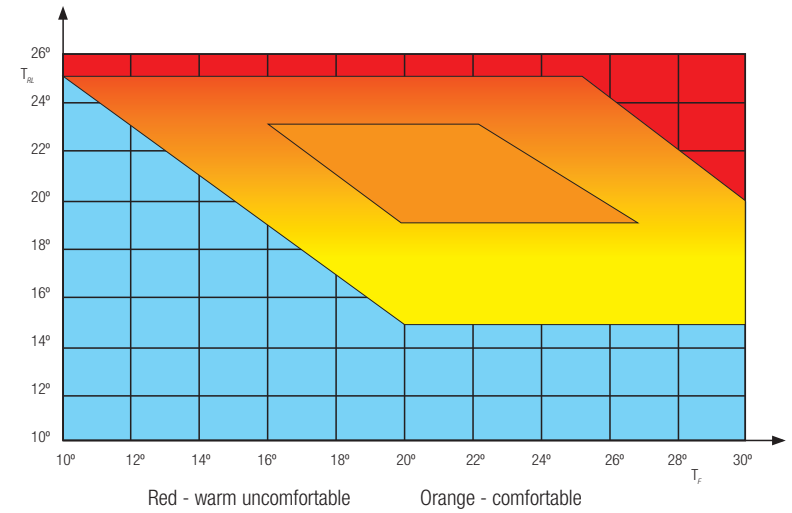
Good for allergy sufferers

Through the REHAU underfloor heating systems' low proportion of convective energy only a minimal thermal vortex is formed. Dust circulation and the carbonising of dust are thus a thing of the past. This protects the airways - not just those of allergy sufferers.

Visually attractive rooms without radiators

The REHAU underfloor heating / cooling systems

- Allow the user to be free with their interior design
- Gives the architect the planning freedom
- Totally eliminates the risk of injury and burning from surface mounted heat emitters hence totally suitable for nurses schools, hospitals, clinics etc
- Lower maintenance costs.



1. Thermal comfort, dependent on the room air temperature T_{RL} and the temperature of the surfaces enclosing the room T_F

Operative Temperature according to CIBSE*

	Winter	Summer
In living spaces and lounges	22-23ºC	23-25ºC
In bathrooms	20-22ºC	23-25ºC

** CIBSE Guide A, Environmental Design*

Room air temperatures according to BS EN 12831

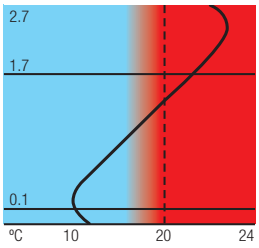
- In living spaces and lounges: 20ºC
- In bathrooms: 24ºC.

Surface temperatures

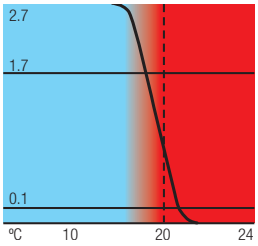
Maximum permissible surface floor temperatures are to be observed for the surface as a surface in direct contact with people for medical and physiological reasons.

- Occupied zone 29ºC
- Peripheral zone 35ºC (generally situated in the floor near large glazed areas).

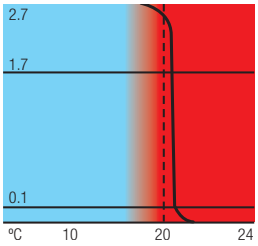
Exemplary temperature profiles in heated rooms



2. Radiator heating



4. Sub-surface heating



3. Ideal heat distribution

1.0 PRINCIPLES OF UNDERFLOOR HEATING/COOLING

1.2 PRINCIPLE OF UFC

Advantages of a Underfloor Cooling System

- High level of comfort
- Draughts do not occur
- Low investment costs
- Low annual costs
- Preserves resources
- Unrestricted interior design.

Thermal comfort

The thermal comfort for one person in a room is determined by:

- The person's activity
- The person's clothes
- Air temperature
- Air speed
- Air humidity
- Surface temperatures.

The heat output of the human body occurs via main three mechanisms:

- Radiation
- Evaporation
- Convection.

The human body experiences the greatest level of well being if it can regulate at least 50% of its heat output through radiation.
With the REHAU underfloor cooling system the energy exchange between people and cooling surface occurs across large areas and predominantly through radiation and thus provides the optimum conditions for a comfortable room atmosphere.

Classic air conditioning systems

Traditional air conditioning systems overcome the cooling loads that occur by **changing the air**, with the following negative effects:

- Draughts
- High room air speeds
- Cold supply air temperatures
- High sound level.

This can often result in uncomfortable air conditions for the user, also referred to as **sick building syndrome**.
Economic disadvantages of traditional air conditioning units:

- High investment costs
- High annual running costs.

Cooling capacity

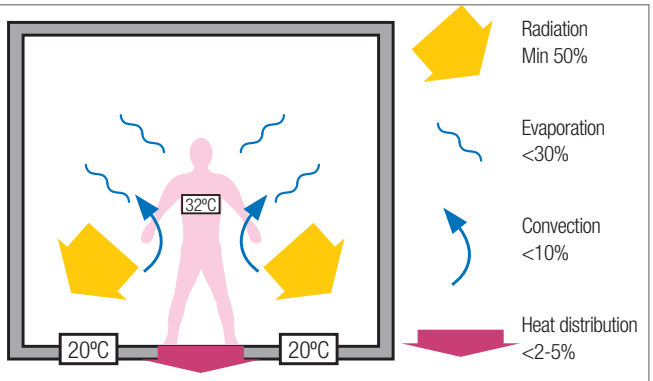
The **standard cooling capacity** of the REHAU underfloor cooling system is 50W/m² in accordance with DIN 4715-1.
The performance estimation was carried out with:

- RAUFIX system
- Distance between pipes 10cm
- RAUTHERM S 16 x 1.5mm
- Coolant temperature 10K
- Temperature spread 2K.

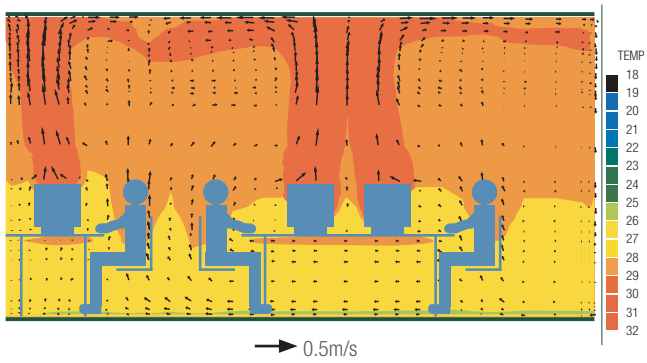
Under **practical conditions**, with

- surface temperature of 19-20ºC
- room temperature of 26ºC

values of **35-40 W/m²** can be obtained.



3. The human being's heat balance



4. Air temperatures and air speeds with pipe underfloor cooling

Influencing factors on the cooling capacity

The sub-surface cooling system's maximum achievable output is dependent upon:

- floor covering
- pipe spacing
- pipe dimensions
- floor construction
- system
- heat gains

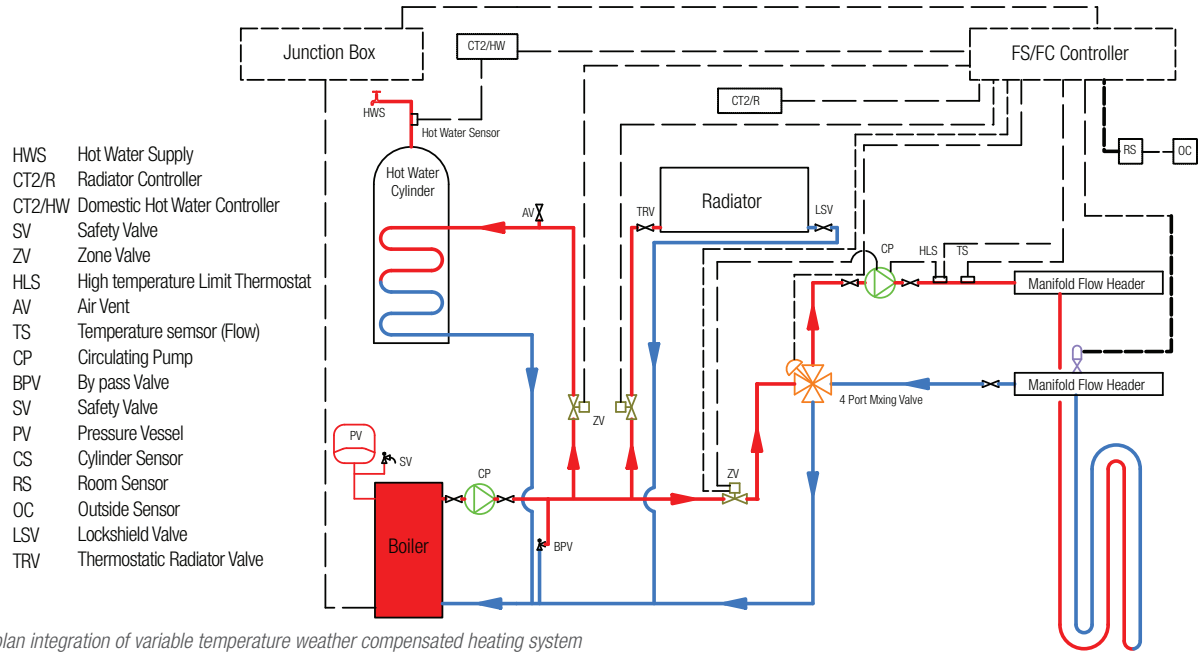
However, each of the factors affects the cooling capacity to a different degree.

The floor covering and pipe spacing have a substantial impact on the output of the cooling system.

It is recommended that only stone, tile or slate type floor or other low resistivity floor coverings are used to maximise the cooling output

1.0 PRINCIPLES OF UNDERFLOOR HEATING/COOLING

1.3 FLOW TEMPERATURE CONTROL



5. 'S' plan integration of variable temperature weather compensated heating system

Heating

A boiler for a conventional combined radiator and domestic hot water system (DHWS) provides water with a flow temperature of around 80ºC. Water is pumped by a Main (system) pump to the hot water cylinder and to the radiators, where it loses temperature. On the return, the water temperature stays at around 69ºC. Current standards and regulations for floor heating state that the surface temperature of a floor must not exceed 29ºC (in perimeter zones and bathrooms 35ºC). Before water can circulate through the REHAU floor heating circuit, it must be mixed with cooler return water to a temperature of between 32ºC - 55ºC. To achieve this a mixing valve is used.

It mixes the 80ºC water from the boiler with cooler water from the return of the floor heating circuits.

1.3.1 Variable Temperature (VT) System

Heating mode

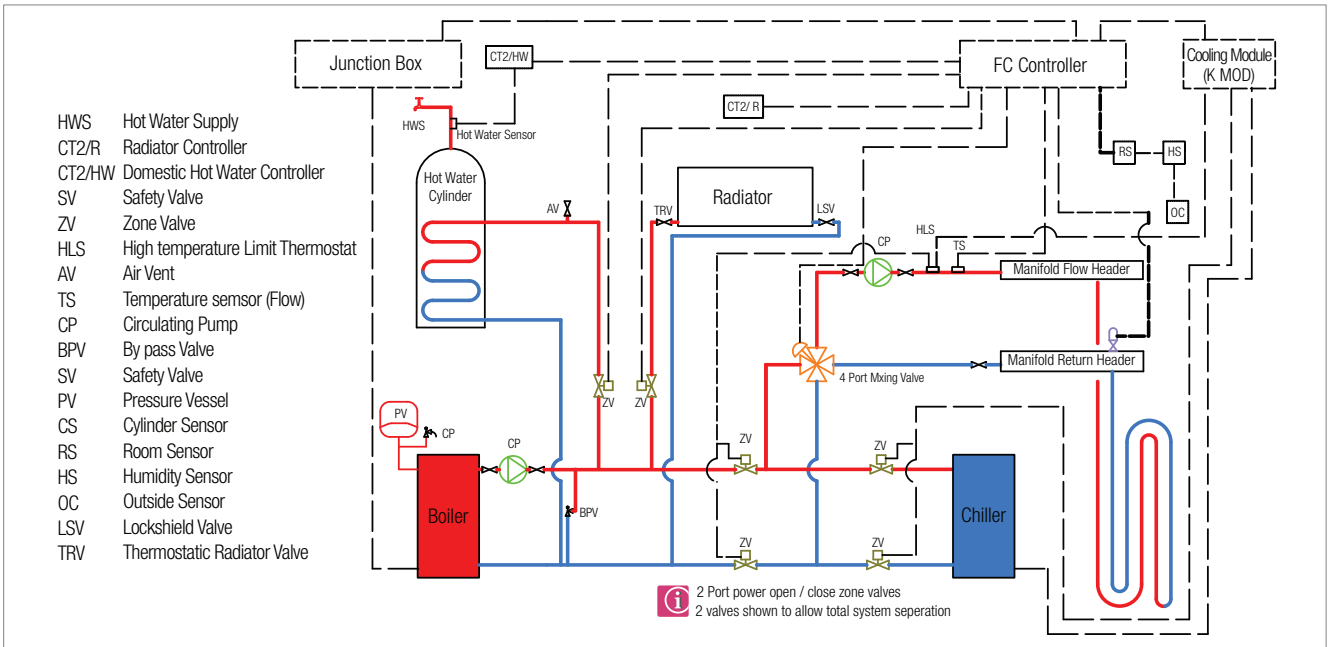
When used with a building management system (BMS) or a computerised controller linked to an external temperature sensor, the system will always choose the optimal flow temperature in relation to the actual heat demand, based on the current weather. A variable temperature system requires external and flow temperature sensors, FS or FC controller to regulate a motorised mixing valve.

Cooling

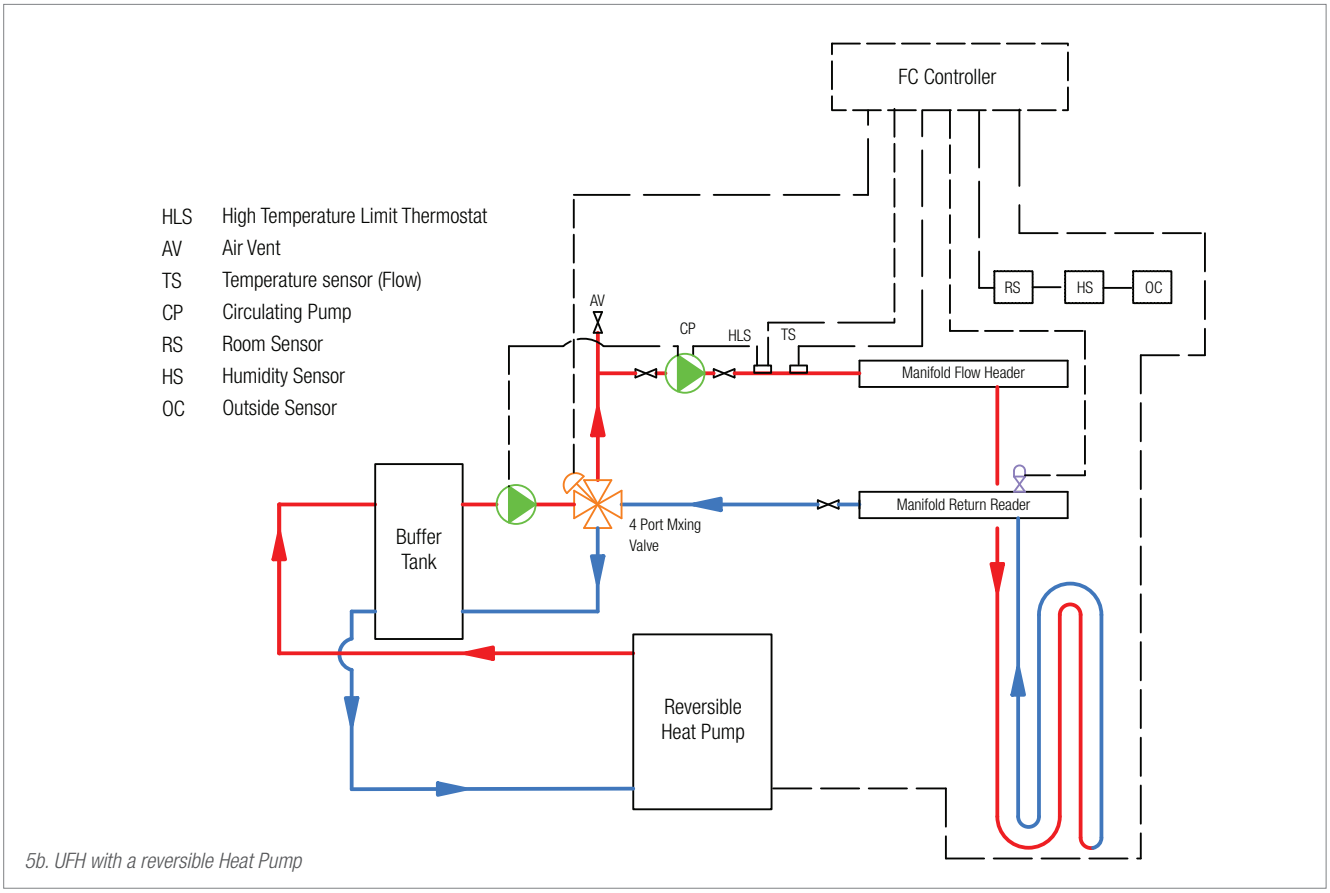
The cooling system will also require mixing if comfort conditions are to be achieved. Mixing is also required to prevent the formation of condensation to the building fabric. For the purposes of cooling, installation of a 4-port mixer is required.

Cooling mode

In cooling mode the water temperature supplied by the chiller unit will be mixed to achieve the optimum water temperature for the cooling system. This mixing will also prevent the formation of surface moisture to cool surfaces should high humidity be detected. If the humidity of the area being monitored achieves critical conditions, the mixing valve will close the cooling circuits.



5a. 'S' Plan intergration of variable temperature weather compensated heating cooling system

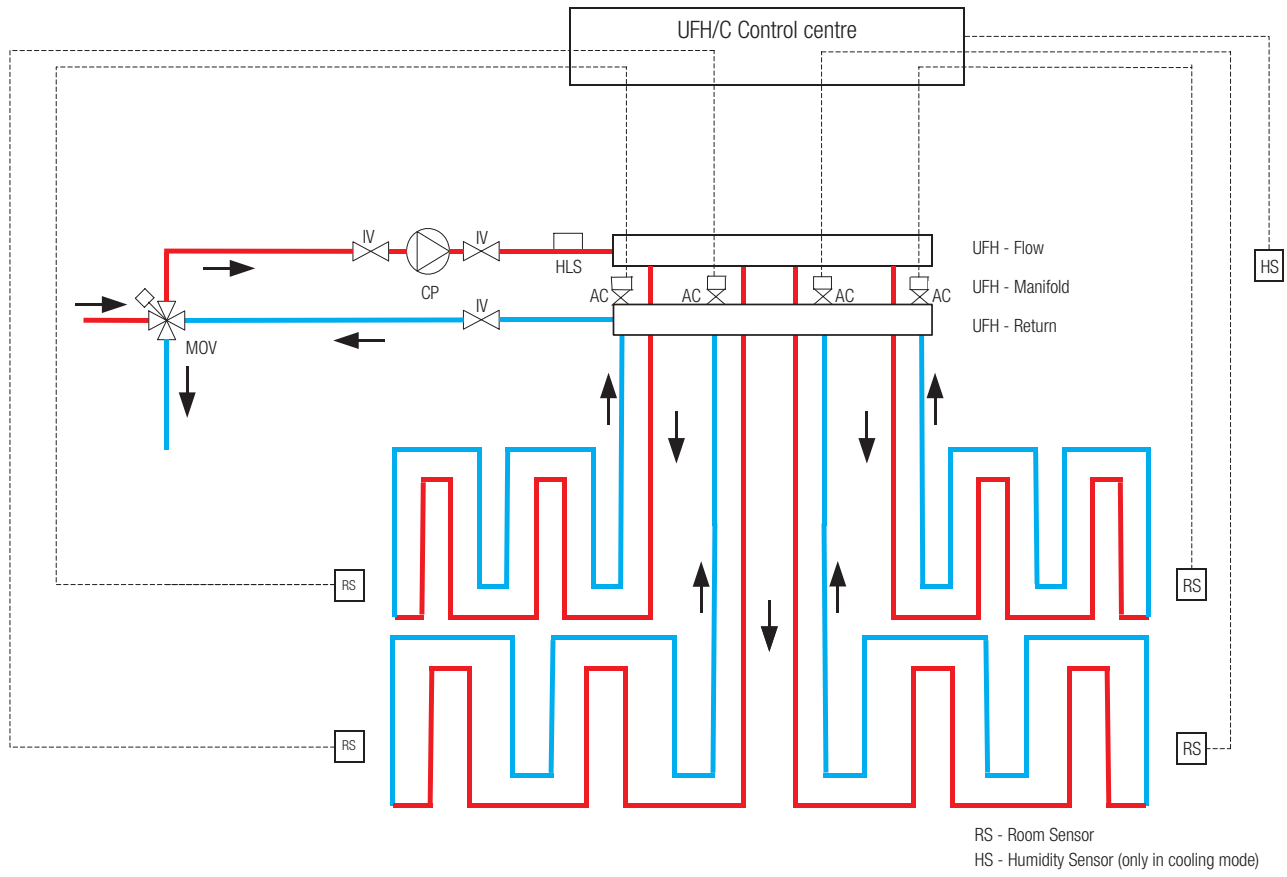


5b. UFH with a reversible Heat Pump

Please note fixed flow temperature regulation is not suitable for use with FS and FC controllers

1.0 PRINCIPLES OF UNDERFLOOR HEATING/COOLING

1.4 ZONE CONTROL



6. Individual zone control with FH

The REHAU INTELLIGENT zone control system is a simple electronic control system that has been specifically designed to give optimum and accurate control of Floor Heating systems.

Heating/Cooling circuits are connected to a central manifold. Each circuit will have a thermoelectric actuator (AC) on the manifold operating the return valve for the circuit.

In heating mode

The heat output in each room is controlled by a room sensor (RS), which continuously compares the required room temperature with the actual room temperature. If the room temperature is too low, it will signal the actuator (AC) to open the return valve of the circuit and allow warm water to flow through it. (As shown in Fig. 6).

In cooling mode

The cooling output in each room is controlled by a room sensor (RS), which continuously compares the required room temperature with the actual room temperature. If the room temperature is too high, it will signal the actuator (AC) to open the return valve of the circuit and allow cold water to flow through it. (As shown in Fig. 6).

Zone controls give control over local/room temperature by adjusting the amount of water circulating within individual circuits/ zones.

Adjustments are made dependent upon:

- Continuous temperature readings from each room sensor (RS)
- The end user settings such as room temperature set point and programmed night set-back periods on the timer

1.0 PRINCIPLES OF UNDERFLOOR HEATING/COOLING

1.5 SET-BACK MODE

1.5.1 Heating

A floor heating system switches into set-back mode instead of switching off completely. This means when you leave the house or at night, the system allows the internal temperature to drop to a lower level. Depending on the installed system components, this reduced temperature level can be set for each room individually or for a group of rooms.

The pre-set temperature for this mode should be carefully selected, because if the temperature is set too low the system will require a large initial input of energy coupled with a long response time to raise the temperature again.

The set back mode enables the system to respond quickly and efficiently when heat is required. It can also make it possible to use a smaller boiler compared to a conventional heating system.

1.5.2 Cooling

Like the heating system the cooling system will also function in set-back mode. Only in cooling mode the set-back temperatures are allowed to increase. The amount of cooling set-back must be carefully chosen to enable the cooling system to respond efficiently when cooling demand is required.

2.0 FLOW TEMPERATURE CONTROL

2.1 SAFETY ADVICE

Authorised specialists

Installation, commissioning, maintenance and repairs of all electrical control components shall only be carried out by trained, competent and qualified specialists in accordance with the national, valid regulations (Health & Safety, Wiring Regulations, etc) and in compliance with the ordinances stipulated by the local power authorities.

Sources of danger

Before opening any component always ensure the system is switched OFF at the main heating system isolation switch.

To clean the components use a dry towel only.

Never clean any units with water or other solvents (e.g. spirit, acetone).

Never touch any live component with wet hands.

Designated application

All equipment explained in the following sections is intended for mixing flow and return water to a suitable mixed water temperature for use with wet Floor Heating/Cooling Systems.

Modifications or changes to this equipment are only permitted with the manufacturer's approval. The manufacturer does not accept liability for damages arising from misusing the equipment.

Fixed Flow Temperature Systems (FFT) cannot be used with REHAU FS and FC Controllers.

2.0 FLOW TEMPERATURE CONTROL

2.2 REQUIRED COMPONENTS FOR VARIABLE TEMPERATURE (VT) MIXING OPTIONS HEATING/COOLING

Component	REHAU Art. No.	Variable Temperature HEATING	Variable Temperature HEATING / COOLING
4-port Mixing Valve up to 12kW (¾" dia BSP, Kv 4)	225118	1x	1x
4-port Mixing Valve up to 24kW (1" dia BSP, Kv 8)	225119	1x	1x
4-port Mixing Valve up to 55kW (1¼" dia BSP, Kv 18)	225123	1x	1x
4-port Mixing Valve Actuator	225124	1x	1x
Male Iron to copper adapters	Not supplied	4x	4x
Circulating Pump with 2x isolating valves	Not supplied	1x	1x
Manifold Isolating Valves	Incl. with Manifold	2x	2x
2-port Zone Valve (22mm) for outputs up to 12kW (Heating only)	230426	1x	No
2-port Zone Valve (28mm) for outputs 12kW to 18kW	230427	1x	4x*
High Limit Sensor	225125	1x	1x

* 4 valves are required to provide safety protection to prevent any cross flow within the 2 systems should the boiler and the chiller operating at the same time and one valve fails i.e. DHW and chiller operation in summer

Only 1 zone valve required in conjunction with heat pumps

2.0 FLOW TEMPERATURE CONTROL

2.3 FOUR PORT MOTORISED MIXING VALVE (MV) HEATING/COOLING

- Suitable for all Heating / Cooling applications
- Use the correct size of mixing valve (according to required heat output: 12kW / 24kW or 55kW)

- The secondary circulating pump only circulates the warm / cold water through the circuits. Separate main system pumps are needed to supply the mixing valve with hot / cold water from the boiler / chiller

2.3.1 Working Principle

The high or low temperature main system flow enters the 4-port mixing valve at 70ºC+ heating, 6°C cooling and is mixed with the cooler / warmer return water from the circuits as required.

On Cooling systems, all pipework to the manifolds will require close cell insulation to prevent condensation forming on the pipe walls and dripping onto other surfaces.

The secondary circulating pump (CP) circulates water at the required design flow temperature through the circuits via the manifold flow header every time there is a demand signal from one of the room sensors. On the return from the circuits water is taken as required, and mixed with the main system flow. The remaining water is then sent back to the boiler.

This type of valve never blocks one port completely, but either separates the primary side and the manifold side in two individual loops or allows the water of both sides to mix to the required temperature.

A temperature sensor strapped to the flow (at a recommended 0.3m after the circulating pump) constantly reads the current water temperature back to the central controller. This controller compares the reading to the desired calculated temperature based on its pre-set heating curve and the current outside temperature.

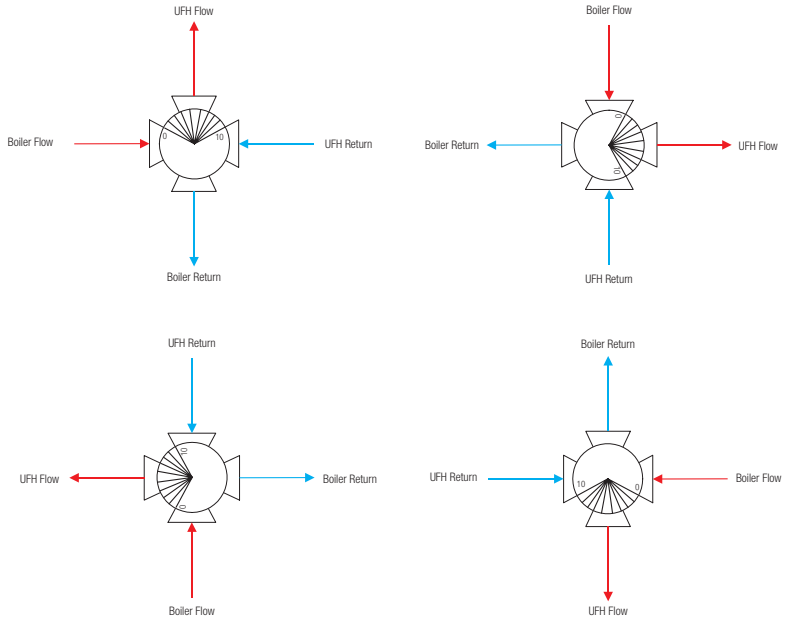
In this way the controller always tries to achieve the optimum flow temperature with regards to energy consumption.

If the flow temperature falls below the calculated temperature, the controller opens the motorised mixing valve (MV) to allow more hot water from the main system to mix with the return water from the underfloor circuits. If the flow temperature exceeds the desired level, the valve is closed to re-circulate more of the return water into the underfloor heating.

If there is a demand signal from any of the room sensors, water is always circulating on the primary side of the valve and is available immediately at the mixing valve.

This will result in a quick response from the Heating / Cooling system to sudden increases in heating /cooling demand.

Required Components	Qty	Supplied by REHAU
Mixing Valve Actuator	1x	Yes
Male iron to copper adapters	4x	No
Circulating Pump (CP)	1x	No
Isolating Valve (IV) of correct size	4x	2x (with manifolds)
Central FS/FC controller with sensors for flow and outside temperature (see subsequent sections for more details on installation)	1x	Yes
High Limit Sensor	1x	Yes



7. Typical pipework orientation

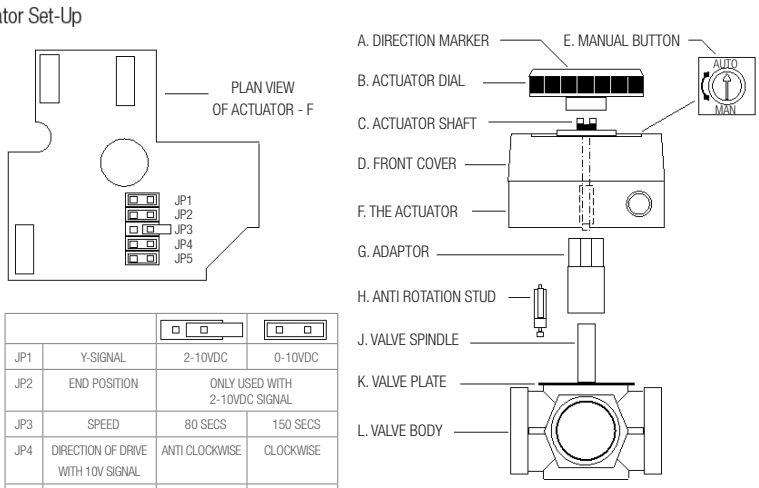
Fitting

(always read and follow instructions supplied with components)

- Fit one male iron to copper adapter into each of the four ports making sure they are properly sealed
- Using two adjacent ports connect one to the boiler flow and one to the boiler return
- Connect the port opposite the boiler (**return**) to the inlet side of the mixed water flow via the circulating pump and the 2-port zone valve
- Connect the remaining port FH return to the manifold return header via the isolating valve
- Fit the secondary circulating pump (CP) using isolation valves on both ports of the pump making sure the pump inlet is connected to 2-port zone valve via pipework and the pump outlet to the flow header of the floor heating manifold
- The mixing valve actuator is supplied with a separate leaflet giving instructions on how to fit it. These instructions must be followed making sure the actuator is positioned correctly on the valve body.

2.0 FLOW TEMPERATURE CONTROL

2.3 FOUR PORT MOTORISED MIXING VALVE (MV) HEATING/COOLING



JP1	Y-SIGNAL	2-10VDC	0-10VDC
JP2	END POSITION	ONLY USED WITH 2-10VDC SIGNAL	
JP3	SPEED	80 SECS	150 SECS
JP4	DIRECTION OF DRIVE WITH 10V SIGNAL	ANTI CLOCKWISE	CLOCKWISE
JP5	ICSP TM	NOT USED	ALWAYS

8. Variable temperature wiring

If the valve body (L) has been installed with the '0' marking on the valve plate (K) requiring the need for anti-clockwise drive to open to the 10v (fully open position) then remove the actuator dial (B) and the actuator front cover (D) and remove the jumper JP4 from its position. Replace the jumper JP4 to the right so as to cover just 1 of the pins the actuator will now drive fully clockwise and take up the opposite starting position ('0' or OFF position). Also remove the direction marker (A) from the actuator knob and reverse this to conform to the change in rotation. Replace the front cover.

Ensure that the D flat side of the spindle faces '0' on the valve plate. Take the BLACK adaptor (G) with the RED V (If a 4-port valve is used the white adaptor is not used). Place this on the valve spindle (J) with the V pointing to '0' Now place the actuator onto the adaptor (G) ensuring the anti rotation stud (H) on the valve body locates into the slot on the reverse of the actuator. The stud should be located in either of the holes on the valve to suit the position of the actuator.

Locate the fixing screw in the actuator shaft (C) into the valve spindle (J) and tighten. Connect the BLACK wire to the terminal in the FS/FC controller, and replace the actuator dial. The valve / actuator combination is now ready for use. When 0 – 10v power is supplied from the controller the actuator will drive to open the valve to supply mixed water to the heating system (as shown in Fig. 8).

2.0 FLOW TEMPERATURE CONTROL

2.4 VARIABLE TEMPERATURE (VT) MIXING OPTION FOR HEATING/COOLING

Technical Data Mixing Valve (4 Port)

For up to 12kW:

Dimensions : 80mm x 80mm x 80mm (H x W x D)*
Kv-value : 4
Body : Cast gunmetal
Internal brass components : DZR brass
Pipe Connection : ¾" BSP Female

For up to 24kW:

Dimensions : 90mm x 88mm x 88mm (H x W x D)*
Kv-value : 8
Body : Cast gunmetal
Internal brass components : DZR brass
Pipe Connection : 1" BSP Female

For up to 55kW:

Dimensions : 90mm x 85mm x 85mm (H x W x D)*
Kv-value : 18
Body : Cast gunmetal
Internal brass components : DZR brass
Pipe Connection : 1¼" BSP Female

Valve Actuator:

Dimensions : 130mm x 95mm x 43mm (H x W x D)*
Speed / Opening time : 80 sec or 150 sec (jumper setting JP3)
Opening Direction : clockwise or anticlockwise (jumper setting JP4)
Body : polymer

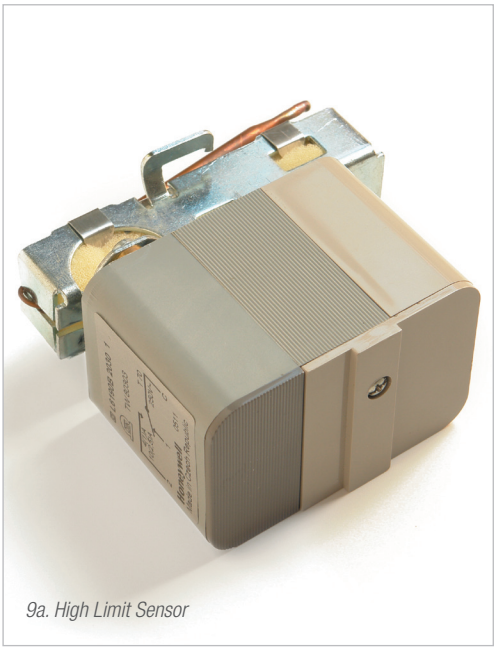
**All dimensions are approximations.*

Connection of mixing valve to Cu pipe work & manifold		
Mixing valve	**Connection to Cu pipe work**	**Connection to manifold**
¾"	4 x ¾" x 22mm Male Iron to Cu adapter	2 *1" x 22mm Male Iron to Cu adapter
1"	4 x 1" x 28mm Male Iron to Cu adapter	2 *1" x 28mm Male Iron to Cu adapter
1¼"	4 x 1¼" x 32mm Male Iron to Cu adapter	Would not be connected directly to manifold

Valve* Kv (Size)	**Flowrates [l/s] at △p 7kPa**	**△ T [K]**	**Q [kW]**
4 (¾")	0.294	10	12.31
8 (1")	0.588	10	24.61
18 (1¼")	1.32	10	55.26

2.0 FLOW TEMPERATURE CONTROL

2.5 FLOW TEMPERATURE SAFETY OPTIONS



9a. High Limit Sensor

2.5.1 Dew Point Control

The dew point control of the system is performed by the Heating / Cooling controllers coupled with the Humidity sensors positioned within the index rooms (section 4.2.1). The controller will calculate the dew point temperature based on the index room temperature and the % of relative humidity within the index room. If the system has more than one humidity sensor installed within the control system then the Heating / Cooling controller will operate to the worst case temperature and humidity conditions. If the water temperature falls below the dewpoint, dehumidifier could be enabled (refer to Section 6.5.1, see page 54).

2.5.2 High Limit Sensor (HLS)

Working Principle

The high limit sensor (HLS) monitors the mixed flow temperature.

This is a safety device, which should be set to a temperature of 15ºC above the max. design flow temperature. In the case of a system malfunction and the max. design flow temperature being exceeded, the high limit sensor (HLS) switches off the secondary circulating pump (CP), and cuts the power to the zone valve. With the zone valve closed and the circulating pump stopped, no hot water can enter the floor heating circuits.

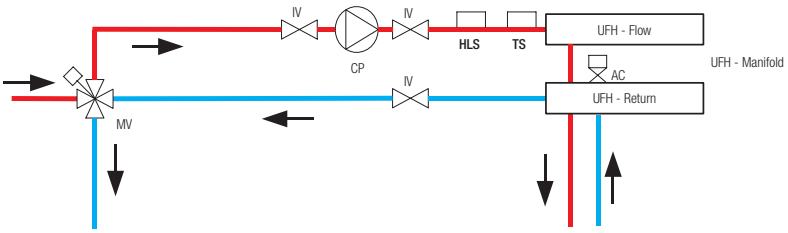
Fitting
(always read and follow instructions supplied with components)

- The high limit sensor (HLS) must be fitted after the circulating pump (CP) and before the manifold flow header. It should also be fitted at least 0.3m to 0.5m after the mixing valve.

2.5.3 High Limit Sensor Installation

Required Components	Qty	Supplied by REHAU
High limit sensor	1x	Yes

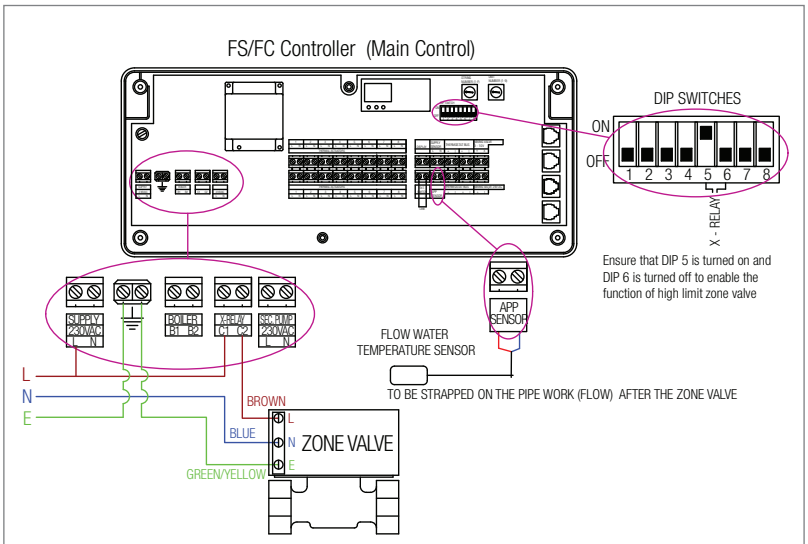
Recommended position for HLS



9b. Recommended Position of HLS (4-port) valve

High Limit Zone Valve

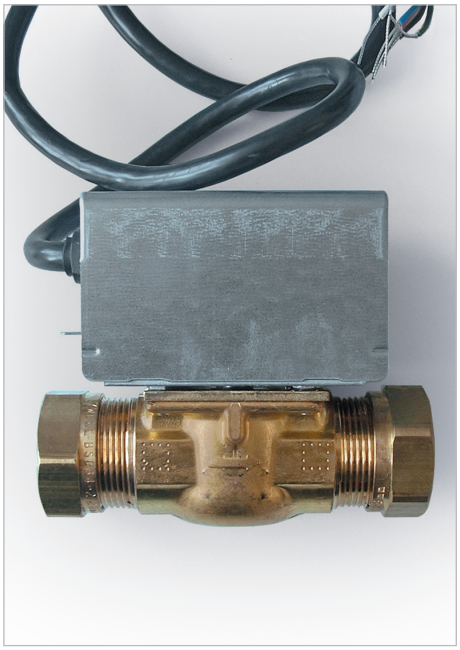
This function is used where an additional protection is required to prevent boiler water entering the underfloor system, when the system is off or when the supply water exceeds 65 C. An additional sensor (ETF-1899A) and a zone valve is connected as per attached Fig.



10. Connections for separate high limitation to the Master Controller

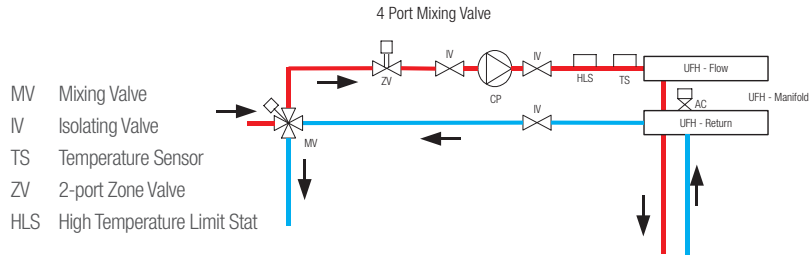
2.0 FLOW TEMPERATURE CONTROL

2.6 ZONE VALVES (ZV)



2.6.2 Zone Valve Heating Installation

Required Components	Qty	Supplied by REHAU
2 - port Zone Valve of correct size (230V)	1x	Yes



11. Locations of zone valve: Compact mixer, 3-port valve, 4-port valve (Heating only)

2.6.1 Working Principle (HEATING)

The 2-port zone valve (ZV) has a dual function:

- To separate the floor heating system hydraulically from other systems supplied by the same heat source, such as the domestic hot water system (DHWS) or radiators
- Close down the flow of hot water from the boiler in case of a boiler malfunctioning.

The 2-port zone valve (ZV) makes it possible to integrate the floor heating with the other systems by employing the 'S- Plan' configuration, which is well established in the heating industry.

Only when there is a demand signal from any of the room sensors will the zone valve be open and allow warm water to enter the floor heating circuits.

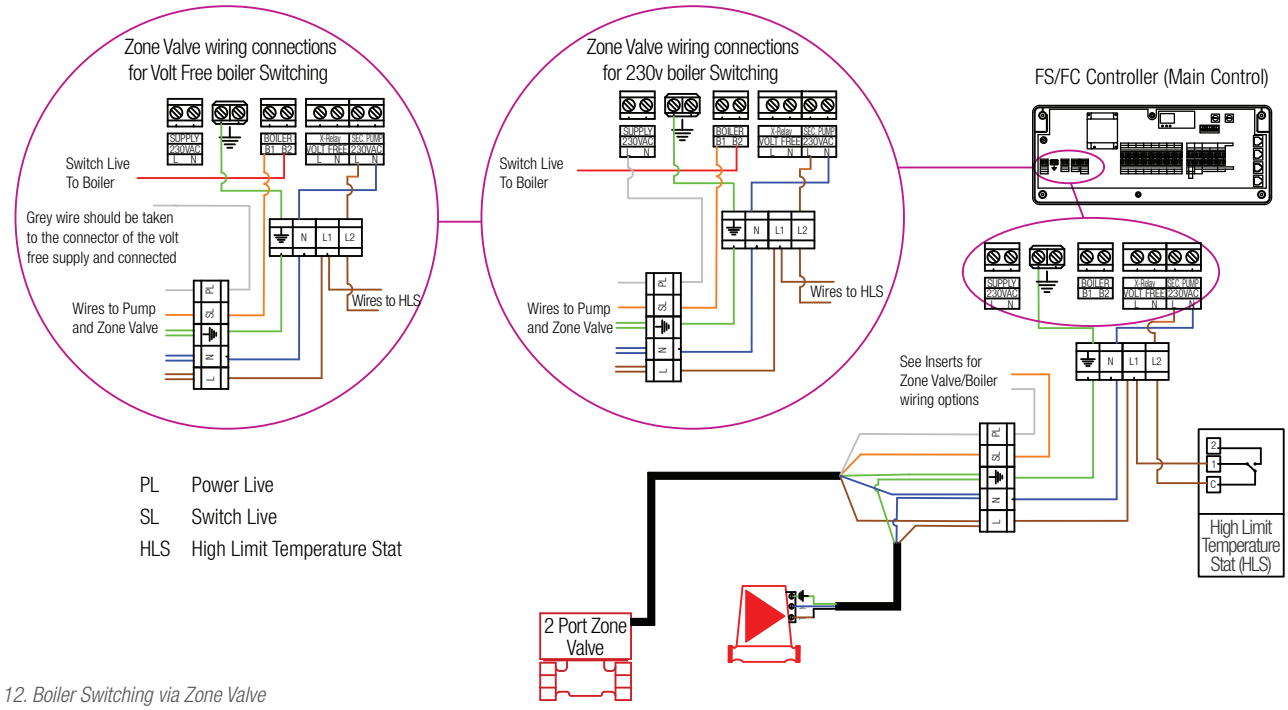
In combination with the high limit sensor, the valve provides additional safety in case the water supply temperature exceeds a pre-set limit. If the high limit sensor cuts the power to the zone valve motor, the in-built spring closes the valve and creates a hydraulic barrier. This means the boiler pump or any other pump can no longer inject water into the floor heating system.

Data

Size	: 22mm or 28mm
Overall Dimensions	: 120mm x 60mm x 95mm (H x W x L)*
Voltage Rating	: 230V AC, 50Hz Switch Rating : 2.2A
Switch Type	: Single Pole Single Throw (SPST) 22mm Single Pole Double Throw (SPDT) 28mm
Power consumption	: 6W
Timings (Nominal)	: ON : 12 seconds: under power OFF: 6 seconds: under spring return
Ambient temperature range	: +50ºC maximum
Flow temperature	: +5ºC to +88ºC
Max pressure	: 0.55 bar differential for close off 8.6 bar static
Auxiliary switch	: 2.2A at 220/240V AC at 50Hz
Flow Direction	: As per Arrow on valve body
Electrical Connections	: 1m Flying lead (heat resisting cable)

2.0 FLOW TEMPERATURE CONTROL

2.6 ZONE VALVES (ZV)



12. Boiler Switching via Zone Valve

High Limit Temperature Stat

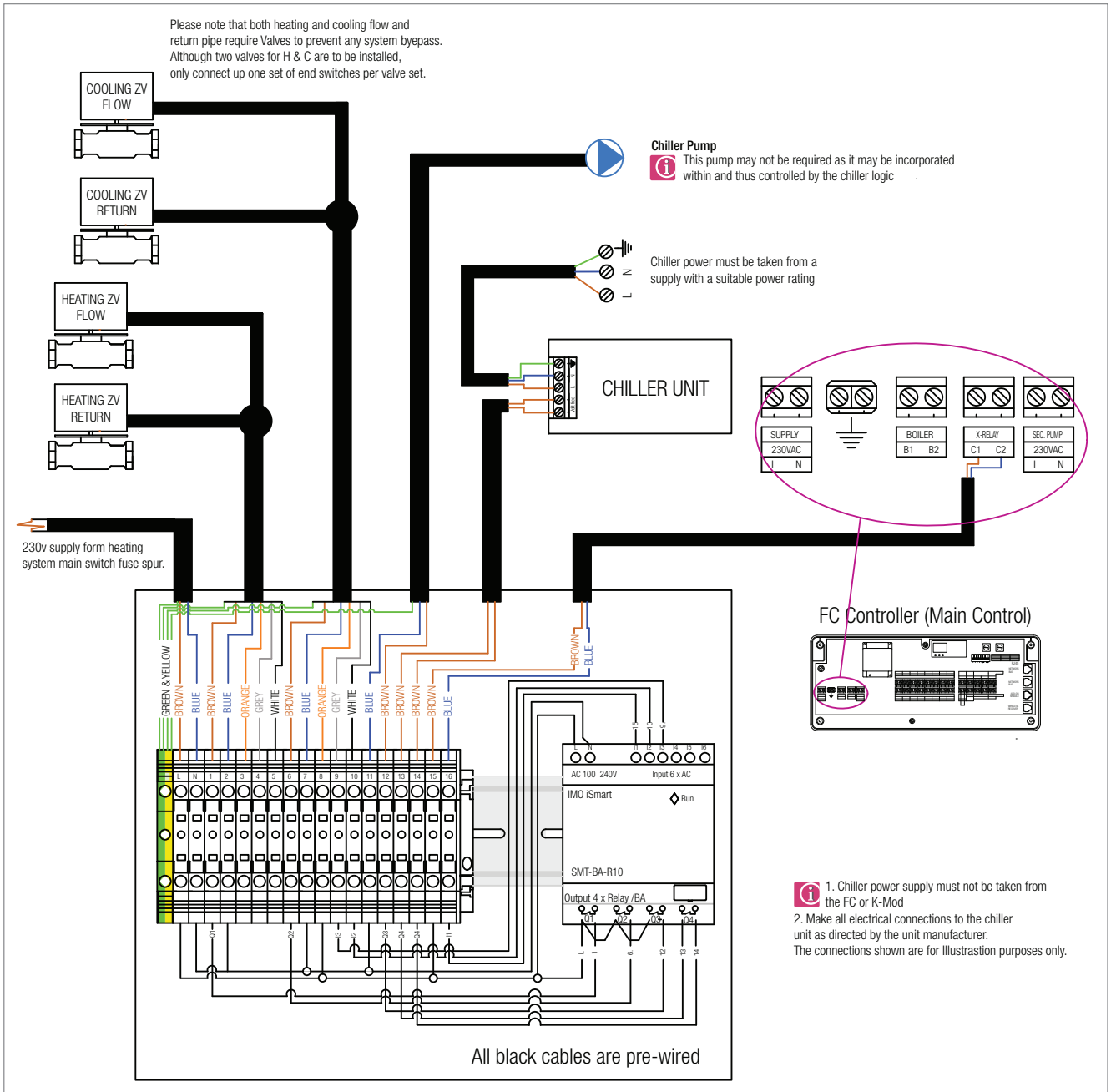
- The live (brown) should be wired into terminal (1) of the Honeywell high limit stat (HLS) Article No. 225125
- The pump neutral (blue) wire is to be connected to terminal 'N' terminal of the main pump connection inside the control centre
- The pump earth wire (green & yellow) connects to the 'E' terminal next to the main pump connection inside the control centre.

Fitting

(always read and follow instructions supplied with components)

- The valve should be installed without blocking any vent or cold feed when closed
- Positioning the zone valve (ZV) at an angle is possible, but it must not be mounted so that the powerhead is below the horizontal level of the pipework
- For recommended positions refer to Fig. 11.

If fitted in a confined space, sufficient ventilation must be available to keep the valve within its ambient temperature range. Also access must be provided to remove the powerhead if necessary.


Please note that both heating and cooling flow and return pipe require Valves to prevent any system byepass. Although two valves for H & C are to be installed, only connect up one set of end switches per valve set.
COOLING ZV FLOW
COOLING ZV RETURN
HEATING ZV FLOW
HEATING ZV RETURN
Chiller Pump
This pump may not be required as it may be incorporated within and thus controlled by the chiller logic
Chiller power must be taken from a supply with a suitable power rating
N
L
CHILLER UNIT
SUPPLY 230VAC L N
BOILER B1 B2
X-RELAY C1 C2
SEC. PUMP 230VAC L N
230v supply form heating system main switch fuse spur.
FC Controller (Main Control)
GREEN & YELLOW
BROWN
BLUE
ORANGE
GREY
WHITE
AC 100 240V
Input 6 x AC
IMO iSmart
Run
SMT-BA-R10
Output 4 x Relay /BA
1. Chiller power supply must not be taken from the FC or K-Mod
2. Make all electrical connections to the chiller unit as directed by the unit manufacturer.
The connections shown are for Illustrastion purposes only.
All black cables are pre-wired

13. COOLING ONLY Wiring diagram showing the K MOD connection to heating/cooling zone valves, chiller pump and chiller units

2.6.3 Working Principle (HEATING & COOLING)

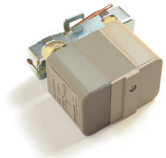
In a Heating/Cooling system the zone valves are a safety mechanism. The system is designed not to operate if the opposite valves are open i.e. the cooling/chiller will not start until the heating zone valve 8 have closed thus preventing any opportunity for cross contamination of the systems. As the REHAU FS/FC controller operates the valves any DHW system can function as a separate unit and supply hot water on demand (please refer to above Fig.).

3.0 REHAU INTELLIGENT FH / C ZONE CONTROL SYSTEM

3.1 COMPONENTS OVERVIEW

3.1.1 Components Overview Heating

Component	Article number	
REHAU FS Controller		
	225114-002 (24V)	The REHAU FS controller is suitable for connecting up to 8 zones of multiple sensors and 24V actuators. It comes supplied with the flow temperature sensor. In addition the controller provides outputs for the UFH pump, boiler demand signal and mixing valve and mixing valve control signal and power (24V). Requires REHAU WLOC-19-RH for weather compensation (Heating only).
Add On Module,		
	225115-002 (24V)	The Add On module provides another 6 zone connections. A maximum of 1 extension module can be used the FS/FC controller to increase the zones up to a total of 14 zones.
REHAU CT2, Programmable Room Sensor		
	225108-002 (5V)	The 24/7 clock combined with the 4-event timer enables the end user to customise his heating system according to his requirements with an adjustment range from +5ºC to +35ºC. This sensor is also able to set the set point temperature for multiple other sensors (except another control sensor). Not used if cooling is to be utilised.
REHAU TP, Tamper Resistant Sensor		
	225109-001 (5V)	This room sensor is the ideal solution for public areas where unauthorised adjustments are to be prevented.
REHAU TA, Standard Sensor		
	225106-001 (5V)	This room sensor offers local temperature adjustment of ± 4ºC from the current set point of zone temperature.
REHAU TM, Comfort Sensor		
	225107-002 (5V)	This room sensor offers identical features to the REHAU TA sensor. In addition it has a slide switch to enable the end user to manually switch the zone into one of 4 modes: Auto, Day, Night and Frost Protection.
REHAU TD Sensor with floor sensor		
	225116-001 (5V)	This room sensor has identical features to the REHAU TM sensor. In addition it comes including a 3m long sensor which can be used to prevent the floor surface temperature to either drop below a pre-set minimum or rise above a pre-set maximum temperature.
REHAU Separate Floor Sensor		
	225385-001	The separate floor sensor works only in conjunction with a CT2 Programmable Room Sensor or TD sensor.
REHAU Remote Air Sensor		
	228007-001	Remote air sensor works only in conjunction with a TM sensor. (Available in Brass and Aluminium, please contact sales office)

Component	Article number	
REHAU OC Module, Outside Air Temperature Sensor		
	225117-001 (5V)	The module is only required if the REHAU FS variable temperature controller is used. It senses the current external temperature and enables the FS controller to calculate the compensated flow temperature. It comes in an IP65 enclosure and should only be installed on north facing walls.
Actuator		
	241293-002 (24V)	The actuator allows individual control of circuits by opening and closing the corresponding isolating valve on the manifold.
Net Extension kit		
	202239-001	If the distance between the master and the Add On Module exceeds 0.3m, then net extension kit is required. This includes 2 connector blocks with RJ 45 cable ends.
24V Relay		
	211786-001 (5V)	As the thermal actuator outputs on the master controller and Add On module are 24 volt ac, there is sometimes a need to convert these to be able to switch 240 volt i.e. for connecting a zone valve, dehumidifier etc. A Relay module R-24- SP can be used on thermal actuator output TH 1 to 8 on Master Controller, TH 9 to 14 on the Add On Module. The relay is designed to operate a switching current of up to 2Amp and is fitted with green indicator lamp to signify operation.
REHAU CT2 / HW, Hot Water Controller		
	202234-001 (5V)	This 24/7 clock combined with the 4-event timer enables the user to customize his domestic hot water according to his requirements. It is provided with a remote flow temperature sensor which is strapped on to the domestic hot water supply pipe from the cylinder (within 150mm of top of cylinder).
REHAU CT2 / 2 Two Stage Controller		
	202226-001 (5V)	This wireless 24/7 clock combined with the 4-event timer enables the user to customize his room temperature according to his requirements. This wireless room controller provides two stage control of a designated area or room which may be part of an underfloor heating system. These units are used where a secondary heat source is employed to boost the temperature within the area if the conventional heating system is not powerful enough.
REHAU CT2 / R Radiator Controller		
	202243-001 (5V)	This 24/7 clock combined with the 4-event timer enables the user to control the temperature of a circuit or Zone of Radiators that are hydraulically independent from an underfloor heating system. For more information refer to section 8, see page 57.
High Limit Sensor		
	225125-002	Over temperature thermal cut-out device with auto reset.

3.0 REHAU INTELLIGENT FH / C ZONE CONTROL SYSTEM

3.1 COMPONENTS OVERVIEW

3.1.2 Additional Components Overview Heating/Cooling

Component	Article number	
REHAU FC Controller		
	202236-001 (24V)	**Variable Temperature** The REHAU FC controller is suitable for connecting up to 8 zones of multiple sensors and 24V actuators. It comes supplied with the flow temperature sensor. The controller is capable of switching between heating/cooling automatically. In addition the controller provides outputs for the UFH pump, boiler/chiller demand signal and mixing valve and mixing valve control signal and power (24V). Requires REHAU WLOC-19-RH for weather compensation (Heating only).
REHAU K MOD		
	229436-001 (230V)	The cooling module is required if a chiller is used for underfloor cooling. It is not required if a reversible heat pump is used for the underfloor cooling.
REHAU Humidity Sensor		
	229435-001 (5V)	The humidity sensor is required for the due point control of a underfloor cooling system.

FC Master Controller replaces FS Master Controller for heating/cooling

3.1.3 Components Overview Wireless Sensors/Controllers

Component	Article number	
REHAU RC, Wireless Receiver		
	202244-001 (5V)	The wireless receiver is required to receive signals from wireless sensors/controllers. Max distance between the master/add on module and receiver is 3 m. Communication distance of up to 30 m inside building and 100m line of sight. The wireless receiver is hard wired to the FS/FC Master Controller/Add On Module.
REHAU RF CT2, Programmable Room Sensor		
	202246-001 (5V)	The wireless 24/7 clock combined with the 4-event timer enables the end user to customise his heating system according to his requirements with an adjustment range from +5ºC to +40ºC. The control thermostat is also able to set the set point temperature for multiple other thermostats (except another control sensor). Not used if cooling is to be utilised.
REHAU RF TP, Tamper Resistant Sensor		
	202253-001 (5V)	This wireless room sensor is the ideal solution for public areas where unauthorised adjustments are to be prevented.
REHAU RF TA, Standard Sensor		
	202251-001 (5V)	This wireless room sensor offers local temperature adjustment of ± 4ºC from the current set point of zone temperature.
REHAU RF TM, Comfort Sensor		
	202254-001 (5V)	This wireless room sensor offers identical features to the REHAU TA sensor. In addition it has a slide switch to enable the end user to manually switch the zone into one of 4 modes: Auto, Day, Night and Frost Protection.
REHAU RF TD, Floor Limit Sensor		
	202245-001 (5V)	This wireless room sensor has identical features to the REHAU TM sensor. In addition it comes including a 3m long sensor which can be used to prevent the floor surface temperature to either drop below a pre-set minimum or rise above a pre-set maximum temperature.
REHAU RF CT2 / HW, Hot Water Controller		
	202235-001 (5V)	This wireless 24/7 clock combined with the 4-event timer enables the user to customize his domestic hot water according to his requirements. It is provided with a remote flow temperature sensor which is strapped on to the domestic hot water supply pipe from the cylinder (within 150mm of top of cylinder).
REHAU RF CT2 / R, Radiator Controller		
	202249-001 (5V)	This wireless 24/7 clock combined with the 4-event timer enables the user to control the temperature of a circuit or Zone of Radiators that are hydraulically independent from an underfloor heating system. For more information refer to section 8, see page 57.
REHAU RF CT2 / 2, Two Stage Controller		
	202229-001 (5V)	This wireless 24/7 clock combined with the 4-event timer enables the user to customize his room temperature according to his requirements. This wireless room controller provides two stage control of a designated area or room which may be part of an underfloor heating system. These units are used where a secondary heat source is employed to boost the temperature within the area if the conventional heating system is not powerful enough.

3.0 REHAU INTELLIGENT FH / C ZONE CONTROL SYSTEM

3.2 WORKING PRINCIPLE

The sophisticated electronic control system was designed specifically for underfloor heating and cooling applications in the residential and light commercial sectors. The room sensors using proportional integral (PI) controls are designed to control the indoor comfort temperature with a high level of accuracy. The sensors communicate with the REHAU FS/FC Master Controller using a bus protocol, which reduces the wiring of the components to a minimum whilst the range of sensor types allows greater flexibility in control system layout and can meet the requirement of most projects.

0.25mm^2 2-core cable is recommended for connecting the system in either star or series (daisy chain) configurations. Standard installation cable (1mm^2 twin) can be used if required. The low voltage (5v) bus system makes it possible to install the room sensors in almost every environment whilst always providing maximum safety.

The temperature requirements of each heated / cooled zone on the system is communicated to the master controller unit of the system, i.e. REHAU FS/FC for variable water temperature heating cooling systems. The master control units will then control the operation of circuit actuators, main system pump, secondary pump and the boiler / chiller switching and the operation of the mixing valve actuator.

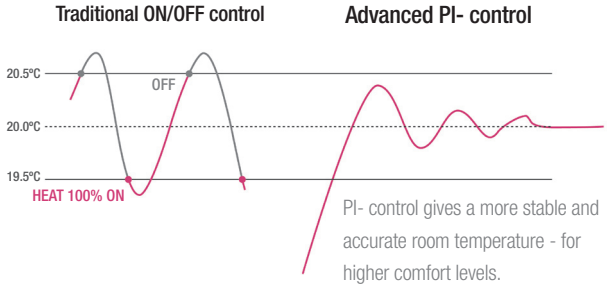
The integration of the system into the 'S' plan control configuration is also possible.

Proportional Integral Control Sensor

The REHAU controller utilises PI Control, this is designed to cover a broad range of specifications. The system uses self learning capabilities to continue optimisation throughout its operation. After approximately 3 – 10 days, depending on the number of operations, the system should reach optimal output levels for given conditions.

Advantages of this form of control are that, after a short period, the controls determine the optimum time to open the actuators, allowing the room to reach the set temperature with minimum overshoot. This gives high comfort levels while ensuring minimum wasted energy.

'Hunting' behaviour, a characteristic associated with traditional sensors, causes the on-off cycling of the boiler when searching for the set temperature; this can result in excessive wear and tear on components. REHAU PI control eliminates the 'hunting' behaviour and can help to increase the cycle life of all system components.



The graph above left shows the 'hunting' temperature profile of a room with a traditional sensor.

The graph above right shows the stabilising effect of the PI controller, improving comfort and saving energy.

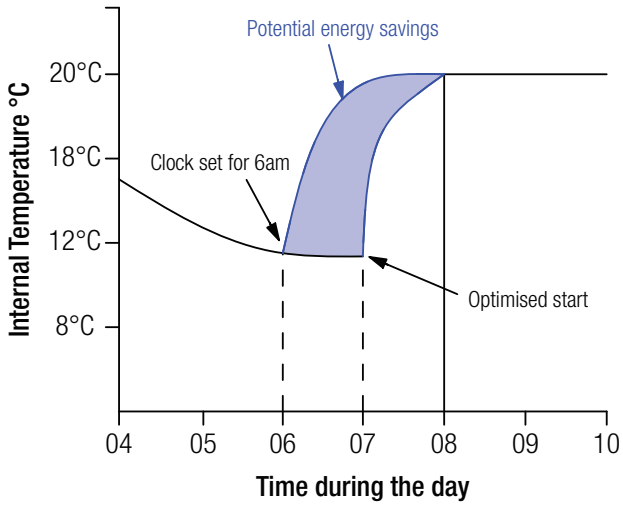
14. Pi-Control of room temperature

Optimum start control

REHAU CT2 Programmable Room Sensor, Radiator and Two stage controllers have an advanced time clock that learns how quickly a building reaches desired temperature i.e. set point by constantly measuring the temperature in the zone. This subsequently brings on the heating at the optimum time prior to building occupancy. This typically results in the heating being switched on later on mild days normally resulting in a 10% energy improvement.

Considering the graph to the right we see that the desired set point temperature is set at 20°C by 8am.

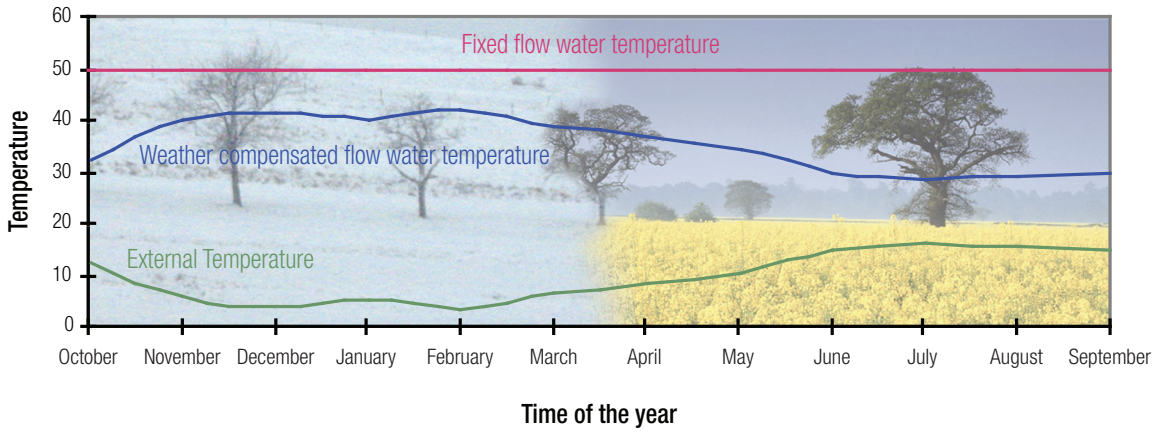
As the REHAU intelligent master uses a software algorithm to control the time to warm up, this varies the required start up point by learning from its previous sensor history and only switching on at the last possible moment to allow the room to reach set point at the desired time. The result is a significant energy saving that is achieved as indicated in blue on the graph above.



15. Graph showing an example of optimised start

3.0 REHAU INTELLIGENT FH / C ZONE CONTROL SYSTEM

3.2 WORKING PRINCIPLE



16. Flow Water temperature with and without weather compensation

3.2.1 Weather Compensation

Weather compensation using Intelligent controls

Weather compensation is the ability to change the temperature of the heating system flow water in relation to the changes in outdoor temperatures.

In the above graph it can be seen that the flow temperature (without weather compensation) is constant and does not vary with the changes in external temperature. This may lead to greater boiler cycles which results in lower efficiency of the boiler over long period of operating time.

From the above graph, with the use of weather compensation the flow temperature gradually decreases with the increase in external temperature and results in comfortable room temperature and higher boiler efficiency.

From the above graph it can be understood that there is a requirement for heating for approximately 235 days in a year, during which the heating system is on peak load for no more than 15 days and running below half load for 2 out of 3 days.

Hence, by weather compensating the floor heating system, there would be reduced boiler cycles and increased energy savings, since the boiler is fired as per the heat demand from the room and not in maintaining a constant flow water temperature. This results in increased boiler life and minimum wastage of energy, and therefore lower CO_2 emissions in comparison to fixed flow.

The values for the external temperature are the monthly averages and have been obtained from the meteorological office for the year 2005.

Weather compensation can only be achieved using an FS / FC controller

Building Regulations

1. All non-domestic hydronic heating installations using floor heating must have weather compensation of the flow temperature – as per the “Non Domestic Compliance Guide, table 4” which is part of the building regulations.

2. It has been stated in the guide that compensation can be achieved by:
a) Directly on the boiler plant (by a BMS or a boiler mounted controls) or b) via the secondary control system responsible for the space temperatures.

3. There are no specific requirements for weather compensation in domestic (residential) regulations although recommended. However, as the buildings are now assessed for their energy efficiency, increased energy efficiency ratings can be achieved with the use of weather compensation.

3.2.2 Required Components for Zone Control

This table should help you identifying which components you need dependent on your choice of zone temperature control. More details on each control option and how they are installed and electrically wired are given in the subsequent sections.

Masters/ Add On modules

		Quantity	
Components	**REHAU Art. No.**	**Heating**	**Heating/Cooling**
REHAU FC (HEATING & COOLING MASTER)	202236-001	No	Yes
REHAU FS (Heating only)	225114-002	Yes	No
K MOD	229436 (230V)	No	Yes*
REHAU OC Module	225117(5V)	Yes	Yes
Add On Module	225115-002	Up to 8 zones: 0x Up to 14 zones: 1x	

* If chiller is used for cooling

Wired Sensors/Controllers

		Quantity	
Components	**REHAU Art. No.**	**Heating**	**Heating/Cooling**
REHAU CT2 (Floor Heating Controller)	225108-002	Minimum:1x (same time setting in all zones) Maximum:14x (different time setting in all zones)	
REHAU TP (Tamper resistant sensor)	225109-001	Up to 8 zones: maximum of 7x Up to 14 zones: maximum of 13x	
REHAU TA (Standard Sensor)	225106-001		
REHAU TD (Comfort plus sensor, includes floor sensor)	225116-001		
REHAU TM (Comfort sensor)	225107-002		
REHAU HS (Humidity sensor)	229435-001	No	Up to 12 HS sensors per controller
Actuators	241293-002	Minimum:1x per controlled circuit Maximum:12x per manifold / controller	
Switch fused spur	Not supplied	1x	
Net Extension kit	202239-001	If the distance between the master and the Add On module exceeds 0.3m, then net extension kit is required. This includes 2 connector blocks each with cables with RJ45 connectors	

Wireless Sensors/Controllers

		Quantity	
Components	**REHAU Art. No.**	**Heating**	**Heating/Cooling**
REHAU RF CT2-RH	202246-001	Minimum:1x (same time setting in all zones) Maximum:14x (different time setting in all zones)	
REHAU RF TP	202253-001	Up to 8 zones: maximum of 7x Up to 14 zones: maximum of 13x	
REHAU RF TA	202251-001		
REHAU RF TD	202245-001		
REHAU RF TM	202254-001		
REHAU RC	202244-001	Minimum: 1x Maximum: 5x Communication distance: Up to 30m inside building and 100m line of sight	

Note Maximum manifold Size = 12-Port

4.0 CONTROL SYSTEM FIRST FIX

4.1 CABLES REQUIREMENTS

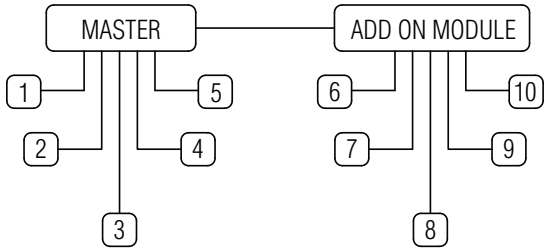
All REHAU control systems must be installed:

- By a competent person.
- In accordance with all local electrical regulations and the current IEE wiring regulations set out in BS 7671
- In accordance with the latest issue of the instructions supplied with each component.

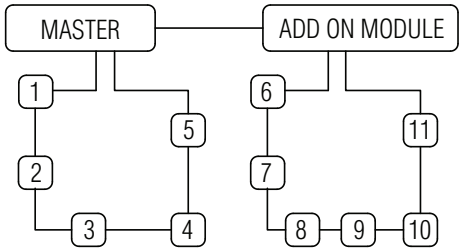
First fix involves the installation of all the electrical cables to the position of the control components and routing them back to the REHAU FS and FC control unit position. Any of the layouts shown below or a mixture of both systems can be used.

The cable termination length at the sensor position should be long enough to allow for connection to the sensor i.e.150mm. This should then be coiled and positioned within an electrical back box. Both Flush and surface electrical back boxes can be used.

- It is very important that the cables terminating at the control unit should have a minimum length of 600mm and ensure that they are clearly identified so at the second fix stage it is clear what the cable does.



SENSORS CONNECTED IN STAR



SENSORS CONNECTED IN BUS MODE (DAISY CHAIN)

17. Star & Series cable layouts

The following cables sizes are required from the component position within the building, back to the REHAU FS/FC controller position.

Description	Cable size	Heating	Heating/ Cooling
Main heating system switch fuse spur to main control unit:	1mm² 2 cores & earth	Yes	Yes
FS/FC Control unit to add on modules	4 core 0.25 mm²	Yes	Yes
Control unit position to zone valve	1mm² 2 core & earth*	Yes	Yes
Control unit position to Mixing valve actuator (MVA)	1mm² 3 core	Yes	Yes
Control unit to UFH circulating pump	1mm² 2 core & earth	Yes	Yes
Room sensor/controller (Daisy Chain or Star)*	0.5mm² 2 core	Yes**	Yes**
Control unit to actuator (if further than 1m away)	1mm² 2 core	Yes	Yes
Wiring to main system boiler controls	1mm² 2 core & earth	Yes	Yes
From K MOD to 2-port Zone valves	1mm² 3 core & earth	No	Yes
From controller to K MOD	1mm² 2 core & earth	No	Yes
Wiring to chiller unit (Heating/Cooling)	To meet the demands of the chiller load. Check with chiller company	No	Yes

First fix work should be carried out whilst the building is under construction and before the plasterwork has started

Specific Specifications of REHAU Intelligent controls

1.	Maximum cable length from controller to actuator	40m
2.	The maximum system cable length using the series layout is	300m
3.	The maximum cable length between sensors/controllers is	100m
4.	The maximum cable length from a sensor to the REHAU FS/FC in star configuration is	100m
5.	Maximum cable length from FS/FC to Add On Module	100m
6.	Maximum cable length of flow temperature sensor to controller	50m
7.	Maximum number of actuators that can be connected to the Master Controller / Add On Module	14/8
8.	Maximum number of actuators on each output on controller	4
9.	Maximum distance between the master/add on module and wireless receiver	3m

* It is recommended that different coloured cables are used for the 5v bus connection of the sensors and the FS/FC controller, care must be taken to ensure correct wiring connection between sensors & controller terminals if wires of the same colour are used.

** Not required if wireless sensors/controllers are used

4.0 CONTROL SYSTEM FIRST FIX

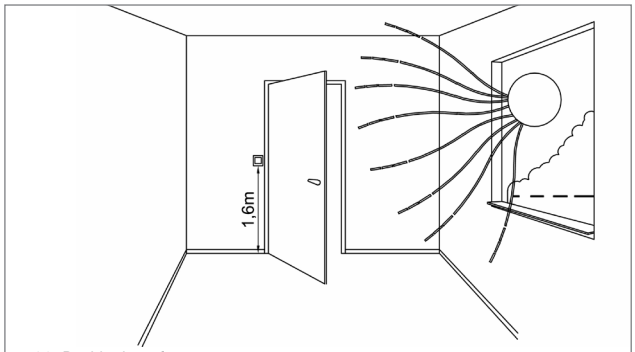
4.2 POSITIONING THE FS AND FC CONTROLLERS ROOM SENSORS AND REMOTE AIR / FLOOR SENSORS

4.2.1 Location of Room, Humidity Sensor and Air Sensor

The requirement for the correct positioning room sensors cannot be overstated. Care must be taken to ensure the sensors are located;

1. In a position with good air circulation at the ambient temperature preferably on an internal wall at a height of 1.6 metres from floor level.
2. The sensor must not be positioned in draughts, above a heat source or where the temperature will be influenced by localised heat gains from direct sunlight, water pipes or appliances.
3. If fixed to a studded wall the cable exit holes should be sealed to avoid draughts.
4. The sensor must be mounted to a vibration free surface.

Humidity Sensor should not be positioned where short term high humidity is possible e.g. kitchen, bathrooms etc.



18. Positioning of room sensor

Location of the REHAU FS and FC Controller

The REHAU FS unit should be installed in a suitable location leaving room to work on the controller. The area should also be clean, dry location mounted on solid vibration free structure within 0.8 metre above the FH manifold. The REHAU FC can be located within REHAU manifold cabinets.

4.2.2 Positioning the Remote Air Sensor

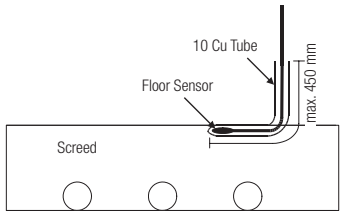
The remote air sensor is supplied fitted into a standard electrical switch blanking plate (White, Brass or Stainless Steel). If required the sensor can be removed from the supplied mounting and fitted into any surface. Required cable size is same, 0.5mm^2 from the remote air sensor to TM sensor position.

Unlike the REHAU TD floor sensor the remote air sensor is only fitted when required and can only be used with the REHAU TM sensor

4.2.3 Positioning the Floor Sensor

The floor sensor should be positioned where it can detect the true temperature of the floor and always be within the heated area of the controlled room.

For easy replacement of the sensor it is recommended that the sensor be placed within a screed/concrete but level with the surface. The sensor can be placed within a 10mm copper sleeve (not supplied) to aid the removal of the sensor. This position will also give a true reflection of the floor surface temperature.



19. Positioning of floor sensor

4.0 CONTROL SYSTEM FIRST FIX

4.3 WIRELESS SENSORS/CONTROLLERS SET UP/RADIO FREQUENCY (RF)

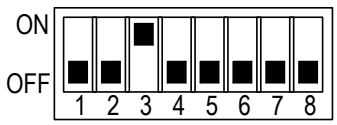
REHAU wireless sensors can be used in conjunction with wired sensors. When using wireless sensors, a receiver unit has to be connected to the main controller. The sensors/controllers are powered by standard AAA batteries and an alarm signal indicates when these are running low. A frequency band of 868 MHz is used in order to maximise communication stability.

4.3.1 Set Up

Where wireless Room Sensors/Controllers are being used, it is necessary for the master controller (FS/FC) to "confirm" that the Room Sensors/Controllers are communicating correctly.

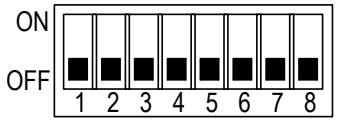
To achieve this:

1. On master, switch on DIP-3 to activate Sensor Check:



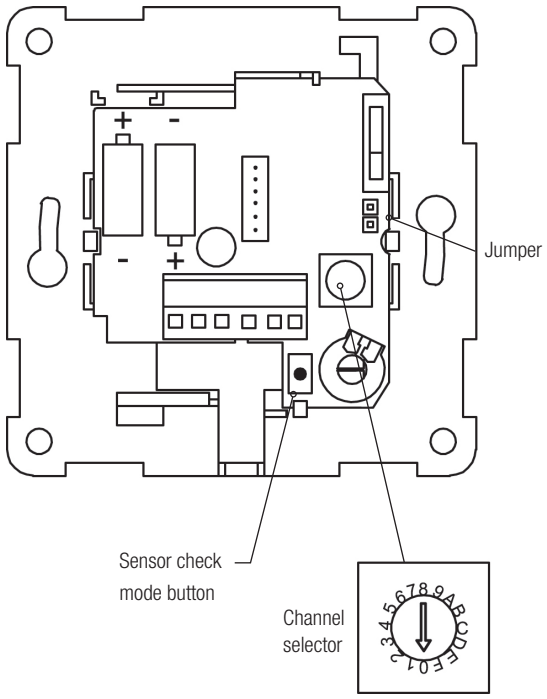
DIP Switch 3 turned to 'ON' on the master controller to enable 'Sensor Check'

2. All wireless Room Sensors/Controllers now have to be initialized (to ensure controllers/sensors are communicating with the main controller)
   a) Room Sensors (RF-TA, RF-TD, RF-TM, RF-TP) are initialized by pressing the internal learning mode button until a beep is heard. (See fig. 20)
   b) Room Controllers (RF-CT, RF-DHW, RF-R, RF-2S) by pressing the pin hole button with the clock symbol until a beep is heard. (See fig. 20)
3. Switch off DIP-3 to de-activate Sensor Check.



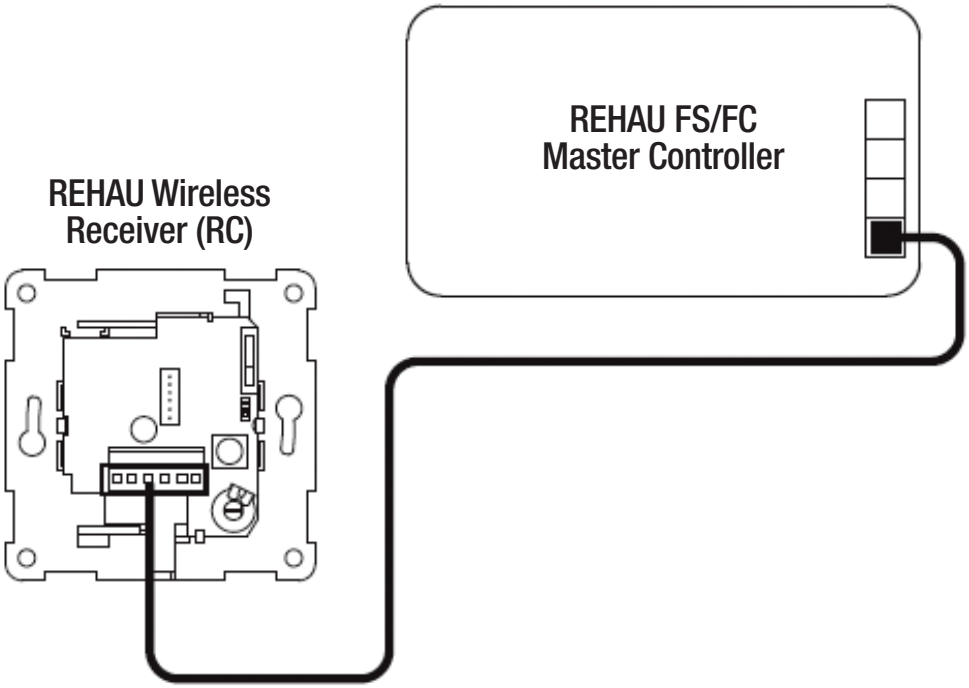
DIP Switch 3 turned to 'OFF' on the master controller to disable 'Sensor Check'

Room Sensor



RF CT2 Programmable Room Sensor/Controller

20. Wireless room sensor / controller



21. Connection of master and wireless receiver

4.3.2 Technical Data

Supply Voltage	24 V from Master
Distance to master	Max 3 m
Enclosure	IP 21
Ambient temperature range	0 to 40°C
Communication Frequency	868 MHz
Communication distance	Up to 30m inside building and 100m line of sight

Connection of master and receiver

The receiver is connected to the master or the add on module using the included cable. Max distance between the master/add on module and receiver is 3m. Up to 5 receivers can be connected. (The wiring of the receivers can be made in either a daisy chain or in parallel)

Positioning

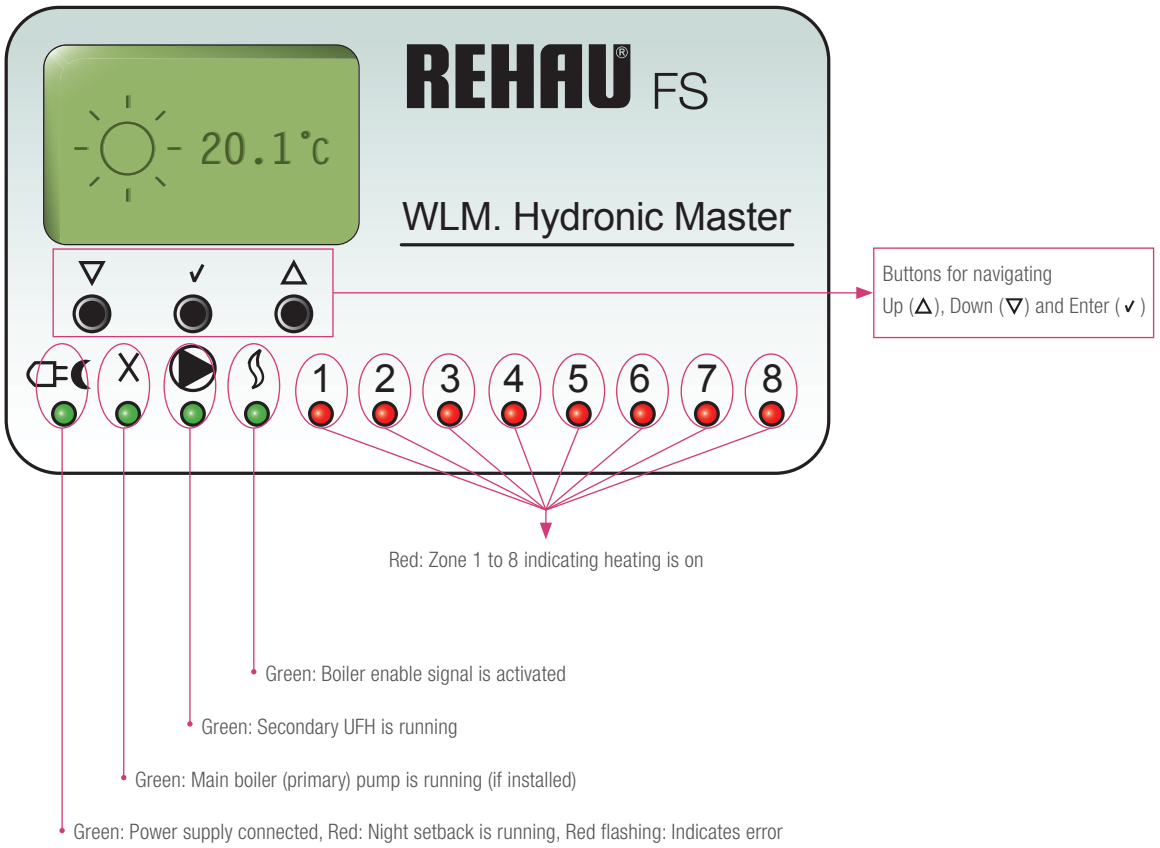
Do not place the receiver inside a metal box. In case of communication problems it may be necessary to move the location of the receiver, or to add an additional receiver.

Configuring

Connect the receiver to the master, and the system will reconfigure itself for wireless operation.

5.0 CONTROL SYSTEM SECOND FIX

5.1 REHAU FS/FC CONTROL UNITS


REHAU FS
20.1°C
WLM. Hydronic Master
Buttons for navigating
Up (△), Down (▽) and Enter (✓)
1 2 3 4 5 6 7 8
Red: Zone 1 to 8 indicating heating is on
Green: Boiler enable signal is activated
Green: Secondary UFH is running
Green: Main boiler (primary) pump is running (if installed)
Green: Power supply connected, Red: Night setback is running, Red flashing: Indicates error

The REHAU FS and FC control unit can operate 8 zones. The REHAU FC zones can be heating only or Heating / Cooling, each of these zones may have a number of FH or FH/C circuit actuators connected. (see section 5.3.3 connecting the thermal actuators)

Each zone / room has a designated output within the controllers (TH1/8). If more zones are required then a REHAU OC extension module has to be provided. Each REHAU FS/FC control unit can facilitate the connection of 1, REHAU Add On extension module making the maximum number of controlled zones 14.

(The setting of the zones is referred to later in the document within Section 6.2, see page 47)

5.1.1 Location of the REHAU FS/FC Controller

The REHAU FS/FC control unit should be installed in a clean, dry location mounted on solid vibration free structure within 0.8 metre above the manifold. The REHAU FS/FC controller can be located within REHAU manifold cabinets.

5.1.2 Fixing the REHAU FS/FC Unit

Removing the 6 screws on the face of the unit will allow access to the three fixing holes provided.

Fix the controller to the building structure using suitable fixing screws do not damage the unit housing. Do not over tighten the fixing screws.

If necessary 10mm spacers (not provided) can be used to allow cables to pass through the cable access panels at the rear of the unit. Alternatively surface cables can be run into the terminals using either the cable release in the cover or by pressing out the cable entries in the lower part of the cover.

5.1.3 Systems Utilising Weather Compensation with Multiple Controllers.

(See section 10, Fig. 53 on page 69)

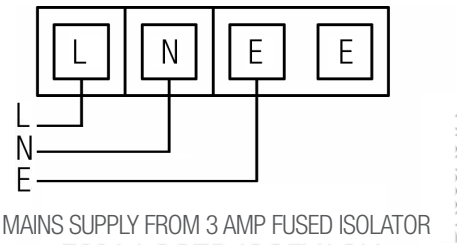
5.0 CONTROL SYSTEM SECOND FIX

5.2 MAINS VOLTAGE (230V) ELECTRICAL CONNECTION TO THE FS/FC CONTROLLER

Ensure that the electrical installation is carried out in accordance with the local wiring regulations and the IEE wiring regulations as set out in BS 7671.

5.2.1 Mains Voltage (230v) Electrical Connection to the FS/FC Controller

The cable from the main system, switch fuse spur should be should be connected via a local isolation switch to the mains terminal block within the REHAU FS/FC control unit marked L, N, E (As shown in Fig. 22).



22. Main wiring connection terminals

5.2.2 Wiring High Limit Sensor

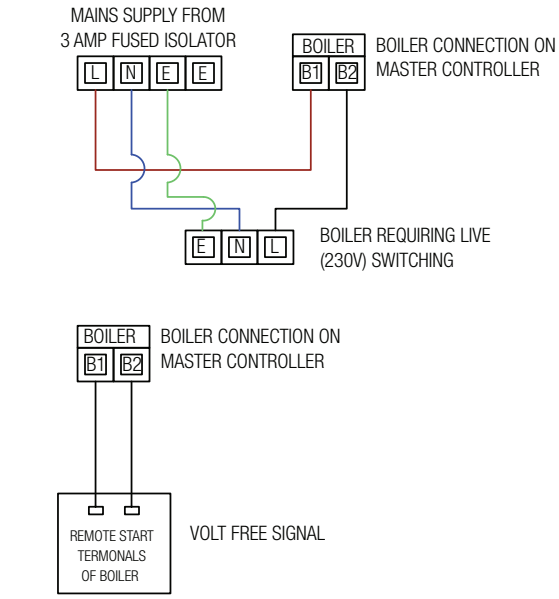
- The pump live (brown) should be wired into terminal (1) of the Honeywell high temperature limit stat (HLS) via terminal (L1) of connector block. Article No 225125
- The pump neutral (blue) wire is to be connected to terminal 'N' terminal of the main pump connection inside the control centre
- The pump earth wire (green & yellow) connects to the 'E' terminal next to the main pump connection inside the control centre (Refer to Fig. 12, see page 22)

Boiler relay will energise 1 min after the start of main pump.

With the REHAU FS/FC Controller, the unit has supply water temperature control and the boiler relay will be ON when the valve has reached 20% open and will remain on as long as there is a demand from the room sensors.

5.2.3 Boiler Connection

The REHAU FS/FC control unit has a volt free relay, which may be used to switch a boiler or to open a motorised valve.



23. Connection Of mains 230v supply and volt free connection to boiler

Connecting the Boiler requiring 230v AC connection (Floor Heating only)

To control the switching of a boiler or motorised valve requiring mains voltage, make a link from the L (230v) mains input terminal to the terminal marked BOILER – B1. Connect the boiler switched live to the terminal marked BOILER – B2. Connect the boiler neutral wire to the terminal marked N in the controller and earth wire to the terminal marked E in the controller. As shown in Fig. 23.

Connecting the boiler requiring volt free (potential free) switching (Floor Heating Only)

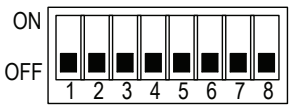
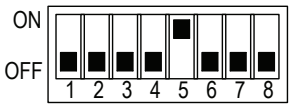
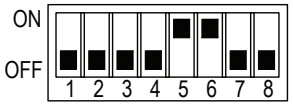
To control the switching of a boiler with dedicated terminals for remote switching e.g. room sensor, connect these terminals to B1 & B2 on the control unit. Terminals B1 & B2 are volt free. As shown in Fig. 23.

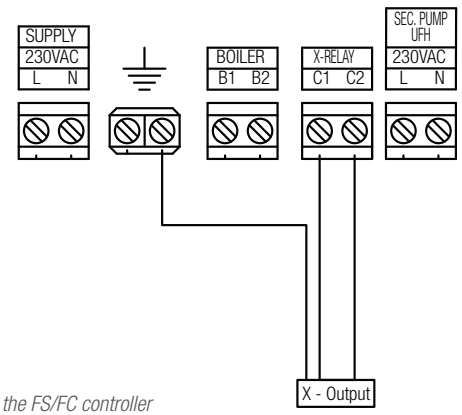
5.0 CONTROL SYSTEM SECOND FIX

5.2 MAINS VOLTAGE (230V) ELECTRICAL CONNECTION TO THE FS/FC CONTROLLER

5.2.4 X-Relay Output

Both FS and FC controllers have a relay which can be utilized for a number of different purposes. The relay is a volt free output and is positioned on the master controller, as shown on the drawing. The function of the relay is determined by the setting of the DIP-switches. The functions that the relay can perform, and the appropriate DIP-switch settings, are as follows:

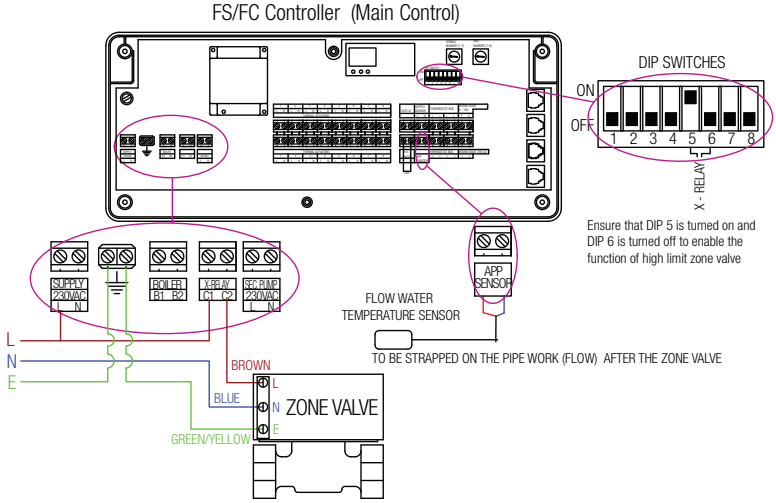
To control	DIP - 5	DIP - 6	DIP switches (located on the master controller)	Description
Main Pump	Off	Off		Where a boiler primary pump is required to be switched on from the master, the X relay output can be used for this purpose. This relay will be activated 10 seconds after the UFH circulating pump has started.
High limit zone valve	On	Off		This function is used where an additional protection is required to prevent boiler water entering the underfloor system. When the system is off or when the supply water exceeds 65°C. An additional flow water temperature sensor and a zone valve are connected (Fig. 10)
Cooling device or module alternative	On	On		The relay output can be used to provide a volt free signal to a heat pump or to a K-MOD (switching module) where a chiller is utilized to provide the cooling water. The relay output is always on in cooling mode and off in heating mode. (Refer to Fig. 26 for connecting K-MOD to Master Controller)



24. X - Output on the FS/FC controller

230V output from X-Relay

The X relay output is volt free as shown in fig. 24 If the relay is required to be used as an L & N switch, connect a link wire from mains live to C1, connect the device live to C2, and the device neutral to mains Neutral.



25. Connections for separate high limitation to the Master Controller

High Limit Zone Valve

This function is used where an additional protection is required to prevent boiler water entering the underfloor system, when the system is off or when the supply water exceeds 65ºC. An additional sensor and a zone valve is connected as per Fig. 25.

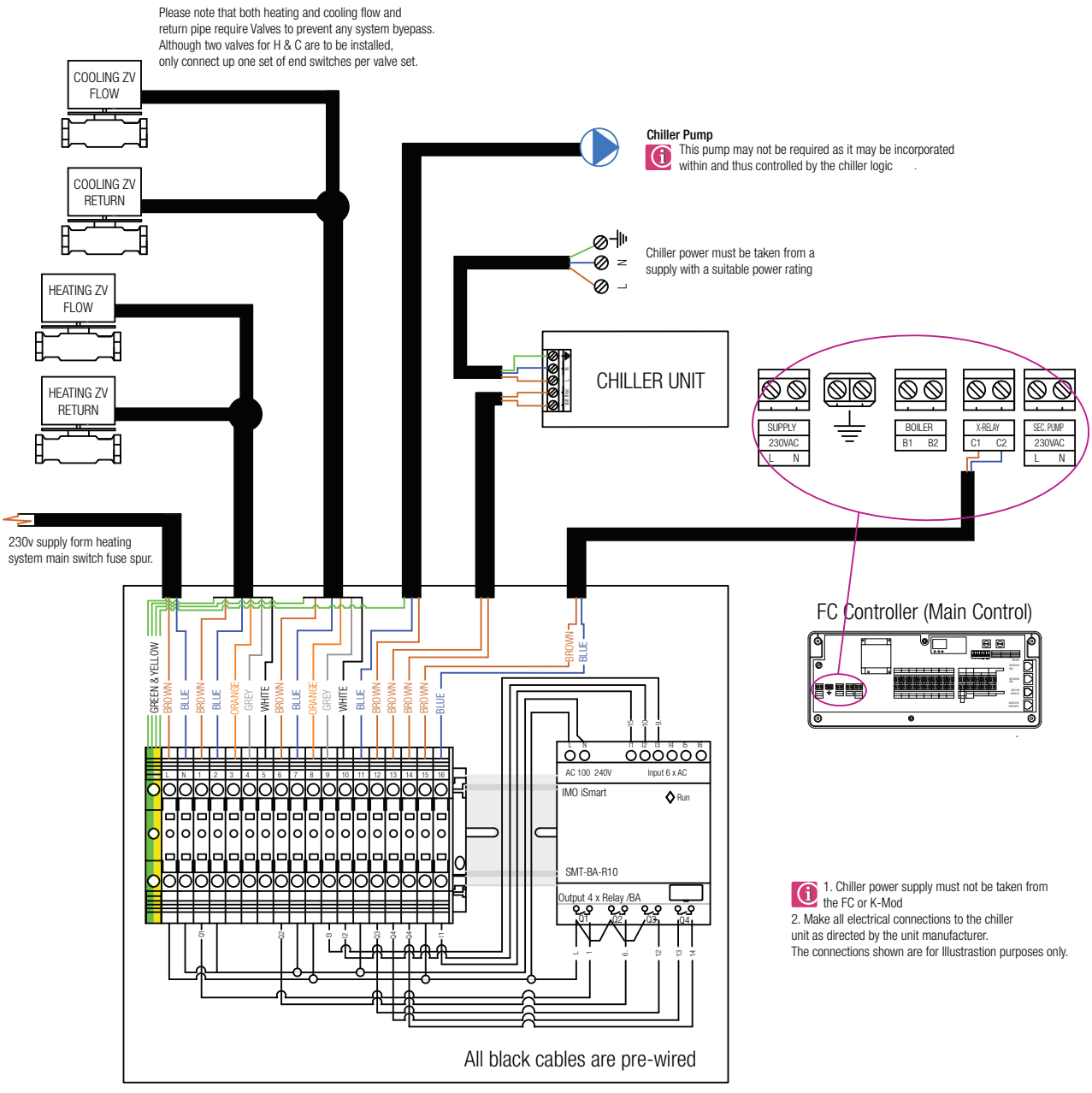
5.2.5 Connecting the Cooling Output to the K MOD

The REHAU heating/cooling Control system will provide an output signal to enable a chiller demand via the K MOD. To prevent any simultaneous operation of heating and cooling the REHAU system zone valve wiring connections must be via this the K MOD. (As shown in Fig. 26).

5.2.6 Connecting the Heating/Cooling Zone Valves

The zone valves REHAU Art No. 230462 (22mm) and Art No. 230472 (28mm) must be used on the system and connected in such a way that when the cooling zone valves are open, the end switch of these valves power close the heating valves thus preventing the hot water from boiler operation e.g. DHW being pumped into the cooling system.

Wiring Connection of these valves are shown in Fig. 26.


Please note that both heating and cooling flow and return pipe require Valves to prevent any system byepass. Although two valves for H & C are to be installed, only connect up one set of end switches per valve set.
COOLING ZV FLOW
COOLING ZV RETURN
HEATING ZV FLOW
HEATING ZV RETURN
Chiller Pump
This pump may not be required as it may be incorporated within and thus controlled by the chiller logic
Chiller power must be taken from a supply with a suitable power rating
CHILLER UNIT
SUPPLY 230VAC L N
BOILER B1 B2
X-RELAY C1 C2
SEC. PUMP 230VAC L N
230v supply form heating system main switch fuse spur.
FC Controller (Main Control)
GREEN & YELLOW
BROWN
BLUE
ORANGE
GREY
WHITE
AC 100 240V
Input 6 x AC
IMO iSmart
Run
SMT-BA-R10
Output 4 x Relay /BA
1. Chiller power supply must not be taken from the FC or K-Mod
2. Make all electrical connections to the chiller unit as directed by the unit manufacturer.
The connections shown are for Illustrastion purposes only.
All black cables are pre-wired

26. COOLING ONLY Wiring diagram showing the K MOD connection to heating/cooling zone valves, chiller pump and chiller units

5.0 CONTROL SYSTEM SECOND FIX

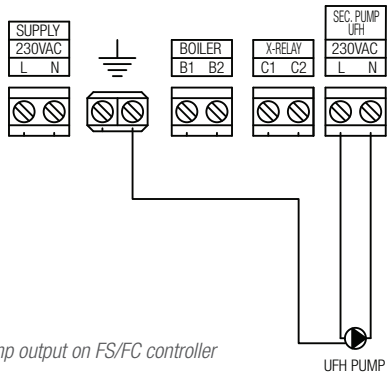
5.2 MAINS VOLTAGE (230V) ELECTRICAL CONNECTION TO THE FS/FC CONTROLLER

5.2.7 Pump Outputs

The master has an output for the underfloor circulating pump (secondary pump). The output will be energised 3 min after the demand from the room sensor. The delay is to allow time for the thermal actuator to start opening.

Connecting UFH Pump:

The 230v AC pump can be connected directly to terminals L and N under the heading “Sec. UFH Pump”. Connect the pump E (Earth) terminal to E (earth) on the master. The maximum pump load must not exceed 4 amps, 230v at start up. There is an overrun period of 1 minute after the demand for heat from the room sensor disappears.



27. UFH pump output on FS/FC controller

Connecting Main Pump:

Please refer to X Relay Output function (Section 5.2.4, see page 38).

Pump control with REHAU Add On Modules

The REHAU Add On Modules each have a secondary pump output terminal so that if a demand for heat occurs from the areas connected to these modules then the local pump can be energised to circulate heated water around this part of the system.

However in some cases there may only be a single secondary pump for the whole system served by the FS/FC Master Controllers and the Add On Modules. This would normally be connected to the secondary pump output of the FS/FC Master Controllers. However if a heat requirement occurs only from an area controlled by the Add On Module then the pump on the FS/FC will not run. If this scenario is likely to be part of the control system design then to overcome this wire up as below. Take a connection from the L terminal of the pump output on the Add On Module and terminate it at the “L” terminal of the secondary pump output within the FS/FC Master Controllers. In this way any demand signal whether from the FS/FC Master Controllers or the Add On Modules can start the secondary pump. (see Fig. 27).

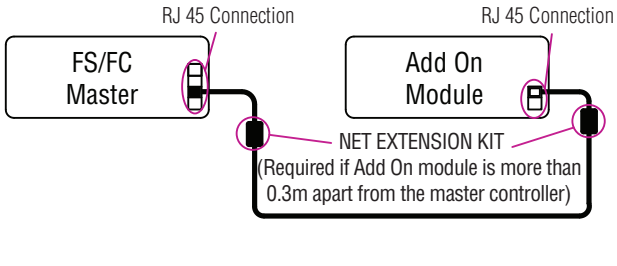
The Pump relays will energise after a delay when any room sensor calls for heat, this is to give time for the circuit actuators to open. The delay times are:

Secondary FH pump 3 min

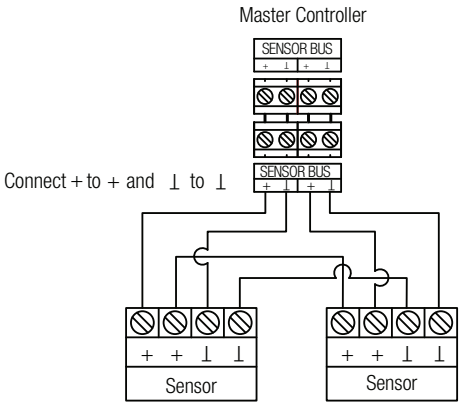
Main pump (If enabled) 3 min 10 sec

5.0 CONTROL SYSTEM SECOND FIX

5.3 NON MAINS VOLTAGE (24V, 5V, & VOLT FREE) ELECTRICAL CONNECTIONS TO THE FS/FC CONTROLLER


RJ 45 Connection
RJ 45 Connection
FS/FC Master
Add On Module
NET EXTENSION KIT
(Required if Add On module is more than 0.3m apart from the master controller)

28. Connecting extension modules



29. Connecting the sensors

5.3.1 Connecting the Add On, Extension Module

The addition of REHAU Add On extension module will increase the zoning potential from 8 to 14 zones. The FS/FC Master Controller is connected to the extension module using an RJ 45 connector cable (this is included with every Add On module). If the distance between the FS/FC Master Controller and the Add On module exceeds 0.5m, then net extension kit is required (Art No: 202239) and use a 4 core cable with 0.25 mm^2.

5.3.2 Connecting the Room Sensors to the Controller Bus

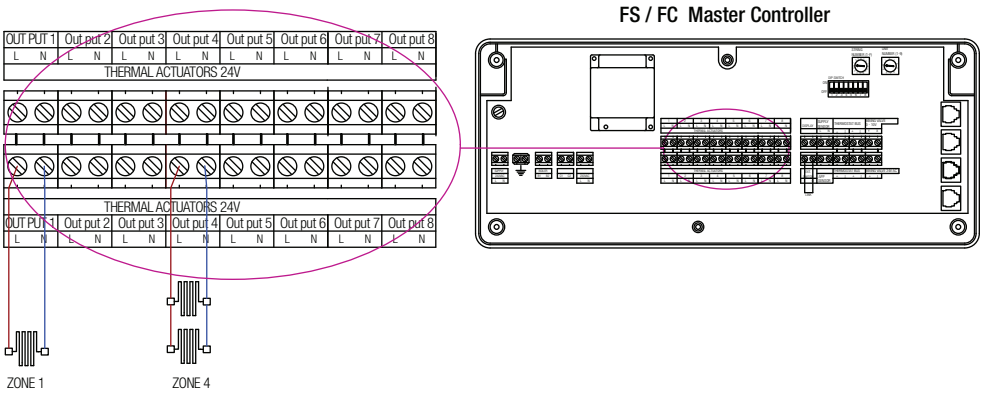
- The maximum system cable length using the Daisy Chain is 300 metre, with a maximum cable length between sensors of 100 metre.
- The maximum distance a sensor can be from the REHAU FS/FC Master Controller is 100 metre. When connected in star configuration

REHAU INTELLIGENT Room Sensors operate on a 5v common Bus system. Both the REHAU FS/FC Master Controller has three sets of identical terminals, which can be used for the connection of the sensors, marked on the printed circuit board ROOM 1 to 3. Any sensor can be connected to any of these terminals. Remember to connect + to + and ⊥ to ⊥

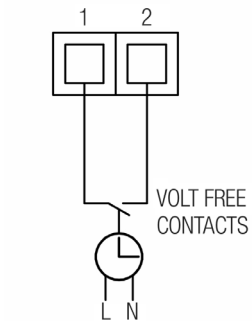
No CT2 Programmable Room Sensors to be installed with FS/FC Controller.

5.0 CONTROL SYSTEM SECOND FIX

5.3 NON MAINS VOLTAGE (24V, 5V, & VOLT FREE) ELECTRICAL CONNECTIONS TO THE FS/FC CONTROLLER



30. Actuator connection to controller



31. Connection of external switch/ timer

5.3.3 Connecting Thermal Actuators (TH 1 – TH 8)

Maximum 14 x 24 Volt actuators per controller. Ensure that the actuators are connected to the correct zone. Actuators controlled by zone 1 must be connected to output terminal 1 (TH 1) etc.

Connect one wire from the actuator to right hand terminal on the respective zone output terminal block (TH 1-TH 8) then connect the other wire from the actuator to the left hand terminal block. These terminal blocks are not polarity sensitive.

Only REHAU INTELLIGENT 2 wire Room Sensors can be connected to the control system. Only sensors compatible and supplied by REHAU Ltd. can be connected to the system. Under no circumstances should any other type/manufacture of 230v or 24v Room Sensors be connected to the system. Connection of such equipment will irreparably damage the controllers & equipment. Such actions will void all warranties.

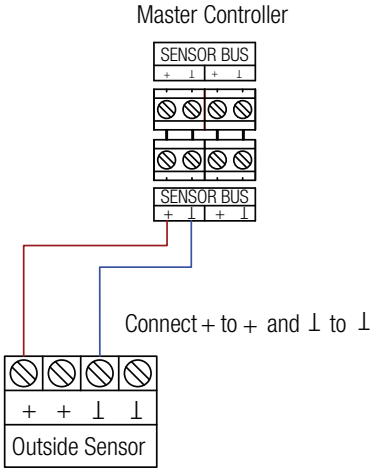
A maximum of 4 actuator heads can be installed into each output, 2 terminal blocks, 14 actuator max. per controller within the controller as long as they are to be controlled by the same sensor.

5.3.4 External Switch/Timer

The controllers can accept a volt free signal from an external switch / timer (see Fig. 31) which will facilitate the switching between day mode and night set back mode only. For setback the switch will be in OPEN circuit and CLOSED for day - time operation. Each controller type comes fitted with a link across the Switch. This link has to be removed and replaced with the switch/timer connection all other system parameters will have to be programmed into either a REHAU CT2 Programmable Room Sensor or the REHAU FS/FC controller.

Connection of the external switch/timer, will override the settings of any CT2 Programmable Room Sensors installed onto the system.

Weather compensation is only possible with the REHAU FS/FC controller coupled with the REHAU Outside Temperature Sensor.



32. Connecting the out side sensor.

5.3.5 Connecting 4-Port Mixing Valve Actuator

To enable the system to be weather compensated the supply pipework to the manifolds must be fitted with a REHAU 4-port modulating mixing valve and actuator.

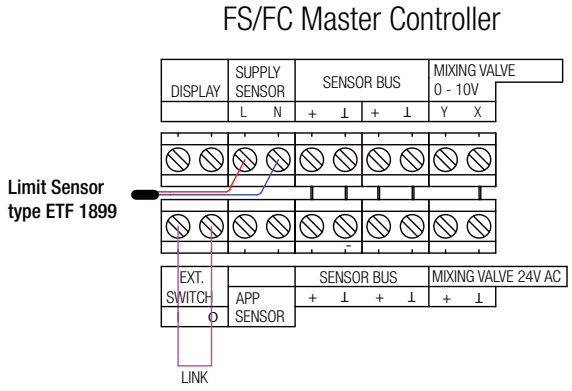
The actuator is supplied with a 1 metre flying lead and connects into the central control unit. The power supply to the actuator is 24v coupled with 0 – 10v switching output signal.

The flying lead can be extended to a maximum distance between valve actuator and REHAU FS/FC controller of 50 metres.

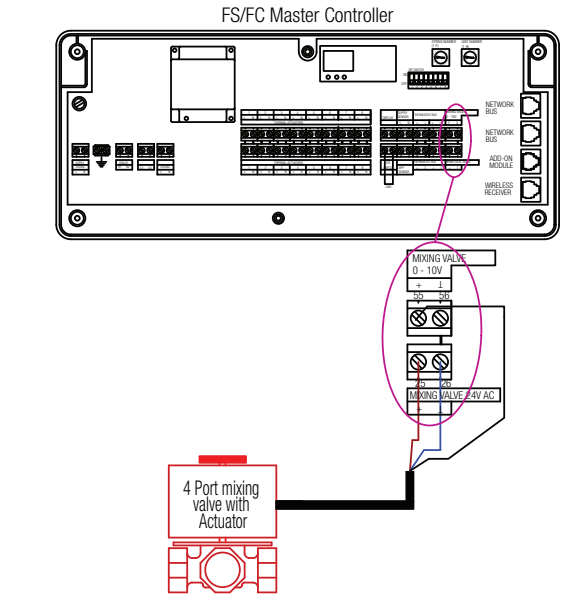
5.3.6 Connecting the Mixed Water Flow Temperature Sensor (Limit Sensor)

This is required to control the mixing valve actuator modulation. It senses the temperature of the mixed water to the manifold and compares this with the programmed heat curve and modulates the position of the paddle within the valve to either add flow or return water to adjust the mixed flow temperature to the manifold.

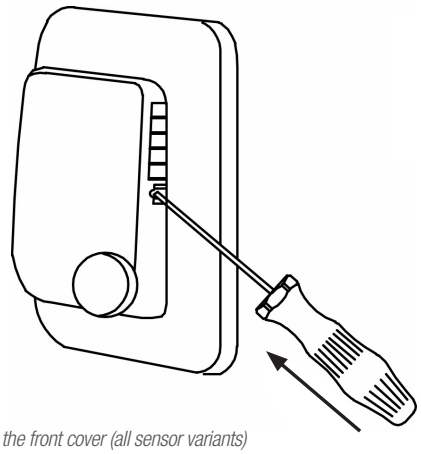
The temperature sensor is fitted onto the flow pipe out of the 4-port mixing valve to the manifold using the flexible straps provided ensure that the sensor is securely fitted to the pipe with no movement. The sensor must be fitted at least 300mm away from the 4- port mixing valve. The wiring of the sensor back to the REHAU FS/FC controller is as shown in Fig. 33.



33. Connecting the mixed water flow temperature sensor



34. Connecting the 4-port mixing valve actuator



35. Removing the front cover (all sensor variants)

5.3.7 Connecting REHAU OC Sensor (Outside Temperature Sensor)

The outdoor sensor should be positioned on a north-facing wall away from any heat source e.g. boiler flue or any ventilation extract outlet and at a height to prevent tampering.

This must be used if weather compensation is required. It is connected to the REHAU FS/FC control unit and uses the 2 wire bus system to communicate with the REHAU FS/FC control unit. The Outdoor Sensor connects to the Sensor Bus in the same way as the sensors.

5.0 CONTROL SYSTEM SECOND FIX

5.4 ROOM SENSORS INTERNAL CONNECTIONS

Sensors can be mounted directly onto the electrical back box either flush or surface mounted. Remove the front cover of the sensor by gently lifting the front cover. Remove the sensor fascia to expose the fixing holes (Refer to Fig. 29 for connecting sensors, see page 41).

Care must be taken not to damage the circuitry or the components on the printed circuit board at this point. Care should also be taken not to deform the sensor back plate when fixing to the back box

Fix the sensor to the back box using the holes provided on the back plate **Do not over tighten the fixing screws and deform the back plate.**

5.4.1 Connect the Wiring

Sensor types REHAU TP, CT, TA, TM & TD

All sensor types are connected dependent upon which wiring configuration used on the first fix, refer to Fig. 29 (see page 41). When the wiring of the sensor is complete refit the fascia plate and the sensor front cover.

CT2 Programmable Room Sensor must not be installed onto a heating cooling system.

5.4.2 Remote Air Sensor Option (TM Sensor Only)

When the positioning of a room sensor is not practical. The REHAU TM sensor offers the option of a remote air temperature sensor.

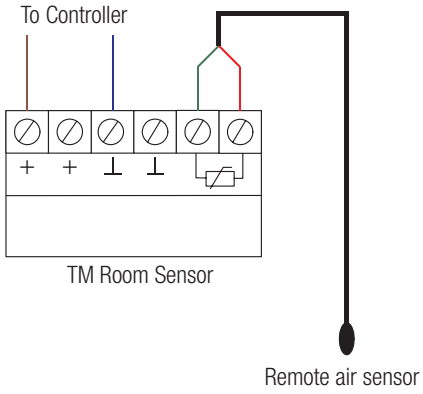
The remote sensor is positioned centrally within a standard single back plate that is suitable for all standard electrical back boxes and can be positioned up to 50m away from the sensor.

The sensor is supplied in the standard operating mode (none remote, internal jumper positioned on 1 pin see Fig. 37).

If the remote sensor option is required the internal jumper within the sensor can be repositioned to cover both pins to provide this option (see Fig. 37).

5.4.3 Connecting the Remote Air Sensor

The sensor is connected to the REHAU TM sensor as shown in Fig. 36. When the sensor is fitted the REHAU TM sensor function will operate in the same way



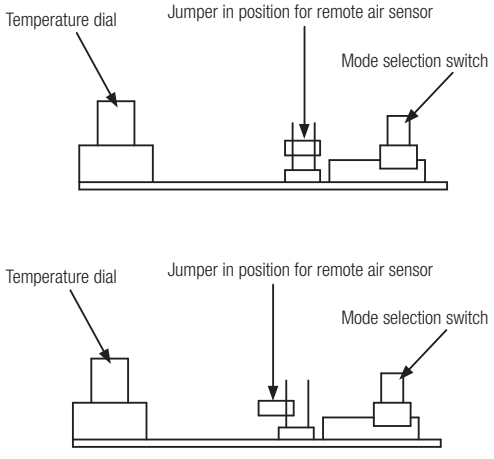
36. Sensor internal wiring with remote air sensor

Unlike the REHAU TD floor sensor the remote air sensor is only fitted when required and can only be used with the REHAU TM sensor

Sensors with a remote air sensor have a mechanical jumper on the right hand side of the printed circuit board controlling the sensor function.

If the sensor is to be positioned within the space then leave the mechanical jumper parked on one of the terminal pins. The sensor should be supplied with the mechanical jumper in this position.

If remote air temperature reading is required then gently remove the jumper and position it on both the terminal pins.


Temperature dial
Jumper in position for remote air sensor
Mode selection switch
Temperature dial
Jumper in position for remote air sensor
Mode selection switch

37. Positioning jumper (side view of TM sensor)

5.4.4 Floor Sensor Option (TD Sensor Only)

Being able to control the minimum or maximum temperatures of floors provides two functions. By controlling the maximum floor temperature you can prevent over heating of the floor. This may be required where special floor coverings are used. Controlling the minimum temperature of the floor surface can create greater comfort levels for the end user keeping the floor at a minimum temperature.

5.4.5 Connecting the Floor Sensor

Sensors requiring floor sensors wire up as shown in Fig. 38.

Sensors with a floor sensor have a mechanical jumper on the right hand side of the printed circuit board controlling the minimum or maximum temperature. The temperature limits are adjustable within the sub menu of the FS/FC controller. If heating only is required then this can be adjusted within the CT2 Programmable Room Sensor sub menu (HiLo) see Fig. 39a for Jumper position.

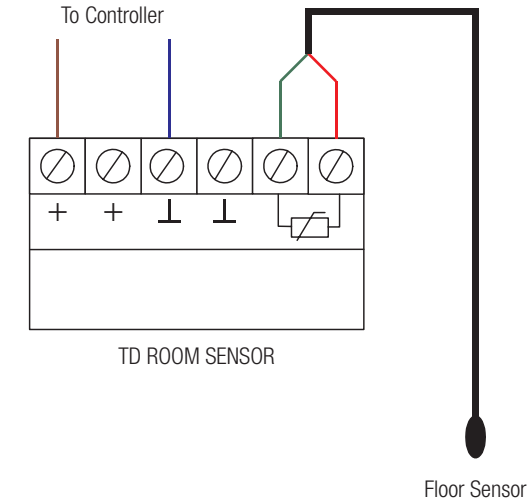
If however, the floor sensor is connected to a REHAU CT2 Programmable Room Sensor as part of a group.

If connected to a system fitted with a REHAU FS/FC controller these limits can be adjusted using the FS/FC menu. Adjusting the limits this way will control either the min/max temperatures for all floor sensors within the group.

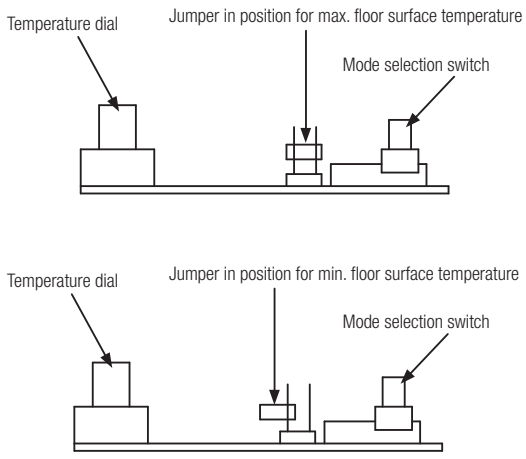
38. Floor Sensor

Note: The REHAU CT2 Programmable Room Sensor can be fitted with a floor sensor. However this is an optional extra, and will require the floor sensor as a separate part REHAU Art No. 225385.

Where REHAU TD sensors are installed within the system. The floor limit sensor must be fitted or the system will not work correctly.



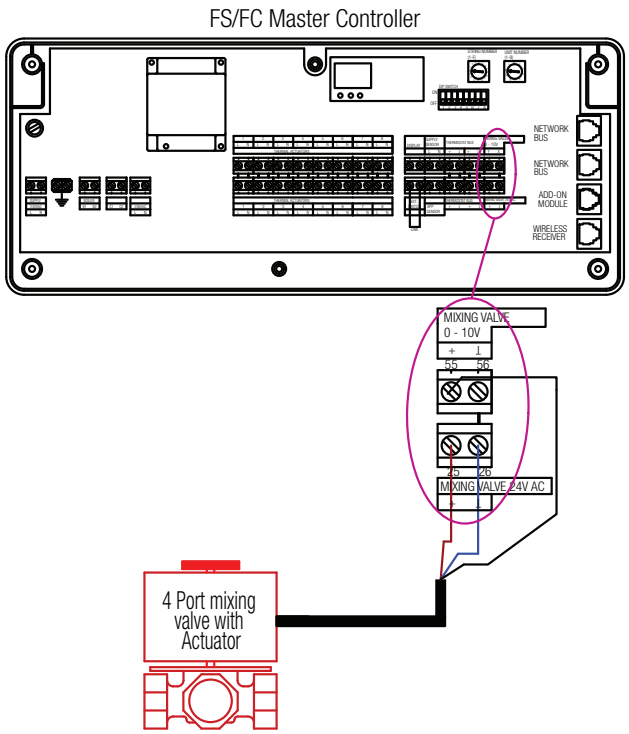
39. Sensor internal wiring with floor sensor


Temperature dial
Jumper in position for max. floor surface temperature
Mode selection switch
Temperature dial
Jumper in position for min. floor surface temperature
Mode selection switch

39a. Positioning jumper (side view of TD sensor)

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.1 MIXING VALVE ACTUATOR



40. Variable temperature wiring

When all electrical connections have been completed, we recommend the following procedure:

6.1 Mixing Valve Actuator.

The actuator (F) is supplied with the drive in mid position (45° of rotation) and the manual button (E) in the AUTO position. Do NOT fit the actuator to the valve at this time. Initially connect the brown and blue wire ONLY from the actuator to the controller. Switch on the power to the controller and the actuator will travel fully in both directions (to find the extent of travel) and then take up the '0' or OFF position. This may take 3 – 4 minutes from the initial position. The direction of drive to open the valve will be clockwise.

The actuator is designed for the control from a 24v supply with a 0-10vdc-control drive as supplied by the REHAU FS/FC Master Controller.

The electrical cable supplied is connected as follows:

Blue	24v Neutral
Brown	24v supply
Black	0-10v control drive.
Red	not used and must be made electrically safe.

- Connect the live (brown) wire of the actuator to the "+" terminal of the mixing valve connection inside the control centre
- Connect the blue (neutral) wire of the actuator to the " I " terminal of the mixing valve connection inside the control centre
- Take the black (0-10V) wire of the actuator to the "Y" terminal of the mixing valve connection inside the control centre.

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.2 SETTING THE HEATED/COOLED ZONES (CHANNEL NUMBERS)

Set the channel selector in all the sensors so that it corresponds with the thermal actuator output that it must activate.

Each sensor on the system is to be allocated a channel number.

Under the front cover of all sensors a selector can be accessed. (As shown in Fig. 42). The number of its output (its CH channel number) can be set with a screwdriver. The channel selection on all sensors can be carried out without the sensor being supplied with power. However, when the power is on, the sensors will need to be given channel numbers and a sensor check has to be enabled (Turn on DIP 3 on the FS/FC Controller) on the REHAU FS/FC Master Controller to ensure all sensors are recognised.

A sensor set to CH 1 will activate the thermal actuators connected to output TH1 within the controller. This will control the actuators connected to that zone. For channel numbers 10 to 14, use the letter designation A to E. 10 = A, 11= B, 12 = C etc.

Channel 15 is a common channel any Sensor set to this channel will override all automatic functions of the REHAU FS/FC controllers and REHAU CT2 Programmable Room Sensors with a single function.

Up to 13 slave sensors can be controlled by one REHAU CT2 Programmable Room Sensor. The REHAU FS/FC Master Controller can only accept 8 heated zones inputs (see Fig. 42a for channel number allocation). If additional heated zones are necessary, an REHAU Add On Module must be utilised.

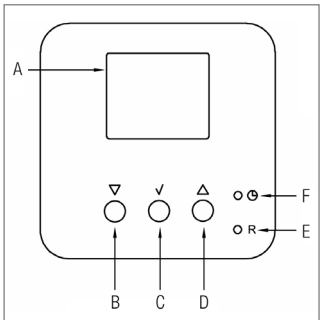
For Channel 0 see section 10.3

Number of zones	FS/FC Controller	Add On Modules
Up to 8 Zones	1	0
9 to 14 Zones	1	1

0	%
MASTER	
1	TH1
2	TH2
3	TH3
4	TH4
5	TH5
6	TH6
7	TH7
8	TH8

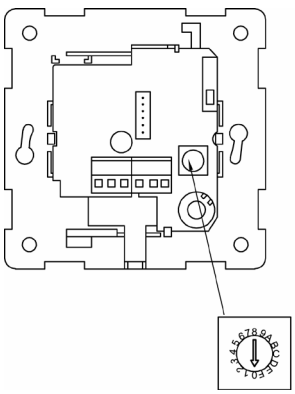
Add On - MODULE	
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14

42a. Controller number designation Within the sensors when used with REHAU Add On Module. This Add On Module can control 6 extra head zones



41. of REHAU CT showing front cover layout

A) Display
B) Down Adjustment
C) OK - Accept
D) Up Adjustment
E) Reset to factory settings
F) Pin button for clock adjustment



42. Channel allocation setting

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.3 SETTING UP THE REHAU FS/FC CONTROLLER (HEATING)

The FS/FC controller come with pre-set temperatures.

With the REHAU FS/FC controller the pre-set figures can be adjusted – the use of a REHAU CT2 Programmable Room Sensor is optional with the REHAU FS/FC controller. However if a REHAU CT2 Programmable Room Sensor is fitted to the system it will override the fixed and the programmed parameter set in the REHAU FS/FC controller.

The master control has the following default temperature settings:

For the FS/FC Master Controller with display, the set points can be altered on the display

(A REHAU CT2 Programmable Room Sensor, fitted has no effect on the weather compensation settings)

6.3.1 Adjusting the Pre-Set Default Temperatures in the REHAU FS/FC Controller;

After the system has been powered up via the main heating system switch fuse spur or isolation switch. By using the up & down buttons you can move through the main menu and into the sub menus to manually adjust the pre-programmed settings. The description of these sub-menus is detailed below.

Default settings on the FS/FC Master Controller			
Description		**Symbol**	**Factory settings**
Day temperature			21°C
Night temperature			18°C
Off Temperature (Frost protection)			5°C
Floor Limit temperature, high			27°C
Floor Limit temperature, low			17°C
Max water temperature			55°C
Weather compensation cold (winter)	Outdoor Temperature		-3°C
	Water temperature		45°C
Weather compensation warm (summer)	Outdoor Temperature		25°C
	Water temperature		30°C

The above set values can be altered

FS/FC Master Controller controls only temperature settings and there is no time control. If a REHAU CT2 Programmable Room Sensor is NOT fitted on the system an external time clock will be required to control the time switching of the system.

6.3.1 Adjusting the Pre-Set Default Temperatures in the REHAU FS/FC Controller

Function	Factory Setting	To modify
Day Temperature (☼)	21°C	1. Locate the day temperature symbol by pressing the Up & Down buttons until the (☼) symbol appears. 2. Press (√) to enter. The temperature reading is now flashing. Using the Up & Down buttons, alter the temperature to that required. 3. Press (√) to accept. This will control the daytime temperature set-point of all sensors on the system.
Night Temperature (Set back temperature). (☾)	18°C	This allows temperature reductions at times of unoccupancy or at night when the heat demand for can be reduced. The REHAU FS/FC Master Controller can accept a volt free signal from an external switch (timer) which will facilitate the switching between day mode and night set back mode. For setback the switch will be in OPEN circuit and CLOSED for daytime operation. Each controller type comes fitted with a link across the TIME terminal. This link has to be removed and replaced with the switch/timer connection. 1. Locate the night temperature symbol (☾) by pressing the Up and Down buttons then press (√). The temperature reading is now flashing. 2. Using the Up & Down buttons alter the temperature to that required Press (√) to accept. This controls the Night-time temperature set-point of all sensors on the system.
OFF Temperature (Frost protection) (❄)	5°C	1. Locate the OFF temperature symbol (❄) by pressing the Up and Down buttons then press (√).The temperature reading is now flashing. 2. Using the Up & Down buttons, adjust the temperature to that required. Press (√) to accept. This controls the OFF temperature for all sensors on the system.
Maximum Floor Temperature (TD sensors only) (↓)	28°C	1. Locate the maximum limit temperature symbol by pressing the Up and Down buttons then press the (↓). 2. The temperature reading is now flashing. Then using the Up & Down buttons to adjust the temperature to that required. When completed press the (√).This controls the maximum floor temperature of all floor sensor sensors on the system.
Minimum Floor Temperature (TD sensor only)(↓)	17°C	1. Locate the minimum limit temperature symbol by pressing the Up and down buttons then press (↓). The temperature reading is now flashing. 2. Using the Up & Down buttons alter the temperature to that required. Press (√) to accept. This controls the minimum floor temperature of all floor sensor sensors on the system.
Maximum Water Temperature ( )	25°C	1. For initial system warm up set the maximum flow temperature to 25°C (See Commissioning section 7) Locate the maximum water temperature symbol ( ) by using the Up & Down buttons 2. Press ( ). The temperature reading is now flashing. Alter the temperature to that required for the type of system installed. 3. Press (√) to accept. This controls the maximum mixed water temperature supplied to the system manifolds.
Setting the Outside Winter Temperature (Heat Loss Design Temp)	-3°C	1. Locate the winter compensation symbol ( ) by pressing the Up & Down buttons then press (√). 2. This gives access to a sub menu. In the sub menu the outside winter temp sensor temperature symbol ( ) will be shown. 3. You adjust this by pressing (√).The temperature reading is now flashing. Using the Up & Down buttons set this to the required winter external temperature. 4. When completed press the (√). This sets the outside winter system design temperature on which the compensated heating curve will be based.

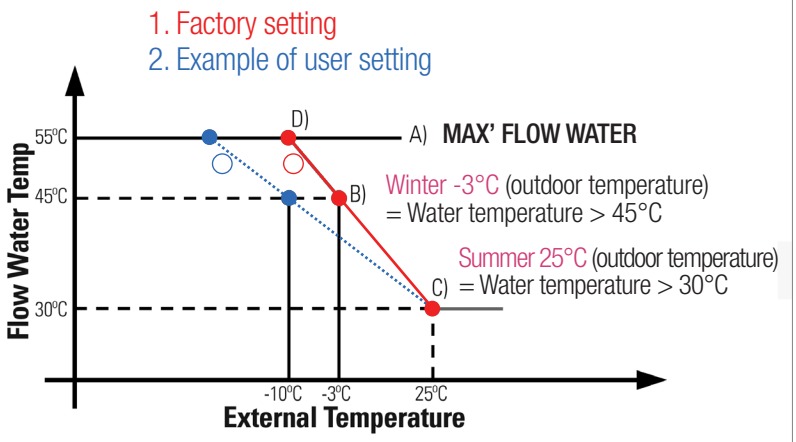
6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.3 SETTING UP THE REHAU FS/FC CONTROLLER (HEATING)

Function	Factory Setting	To modify
Setting the Winter Water Temperature	45°C	1. Locate the winter water temperature symbol ( ) by pressing the Up & Down buttons. Press (√). The temperature reading is now flashing 2. Then using the Up & Down buttons to adjust the water temperature to that designed for the system. 3. Press (√) to accept. This sets the temperature of the mixed water flow into the system. 4. When this is completed you will have to return to the main menu by pressing the down arrow to the Return symbol ( ).
Setting the Outside Summer Temperature	25°C	To allow the water temperature ramp to be calculated you will need to input into the system the summer air and water temperature required. This will be in the region of 25°C air 30°C water. 1. Locate the summer compensation symbol ( ) by pressing the Up and Down buttons. Press the (√). This gives access to a sub menu 2. In the sub menu locate the outside summer temperature sensor symbol ( ) will be shown. The temperature reading is now flashing 3. Then using the Up & Down buttons to adjust the water temperature to that designed for the system. 4. Using the Up & Down buttons set this to the required summer external temperature. When completed press the (√) to accept. This sets the outside summer design temperature on which the compensated heating curve will be based. This is usually 25°C.
Setting the Summer Water Temperature	30°C	1. Locate the water temperature symbol ( ) by pressing the Up & Down buttons. 2. Then press (√). The temperature display is now flashing. Using the Up & Down buttons adjust this to the required temperature. 3. Press the (√) to accept. This sets the temperature of the mixed water into the system. This should be set to the summer supply flow temperature required when the outdoor temperature is achieved i.e. outside temperature 25°C water temperature 30°C. 4. When this is completed you will have to return to the main menu by pressing the down button to the Return symbol ( ). Programming of the FS/FC Master Controller is now complete
Service Menu ( )	-	1. Press the (√) to enter the service mode. The first display shows the loaded software version. The software version loaded onto the controller i.e. 2. Press the Down button to show the next display If the OK is displayed, there are no faults. If 'E' is displayed there is an error. 3. Press the (√) to show the next display. This will identify on which channel the error has occurred. This display will also show which channels are in use. Press the (√) to show previous display. C00 - 0U--- | C08 - 0U--- C01 - 1U-E1 | C09 - 0U--- C02 - 1U-OK | C10 - 0U--- C03 - 0U--- | C11 - 0U--- C04 - 0U--- | C12 - 0U--- C05 - 0U--- | C13 - 0U--- C06 - 0U--- | C14 - 0U--- C07 - 0U--- | C15 - 0U--- 4. Then press the Down button to enter The outdoor temperature display 18°C. 5. Press the Down button to show the next display 34°C this shows the actual mixed water temperature. 6. Press the Down button to show the next display 35°C This shows the calculated set point by the controller for the supply water temperature. 7. Press the Down button to show the next display 8.2V . This shows the mixing valve position (0-10v). 10v indicates the mixing valve to be fully open. 8. Press the Down button to show the next display . This will display the temperature of each zone including floor temperature sensor maximum & minimum temperatures. Press accept ( ) and Up or Down button to select room. If a limit sensor is connected the measured temperature is shown, above (maximum) or below (minimum) the room temperature. The room temperature is shown in the middle. 9. To exit the service menu at any time press the Up or Down button then press accept (√) to return to the main menu.

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.4 WEATHER COMPENSATION (HEATING)



43.

6.4 Weather Compensation (HEATING)

Weather compensation can only be achieved if the REHAU OC outdoor compensation module, temperature sensor & 4-port mixing valve is installed with a REHAU FS/FC controller.

For the controller to calculate the required flow temperature, dependent on external temperature, the design parameters are required. This will be the design flow temperature (given on the UFH Design) and the design external air temperature for the location, usually for the UK & ROI –3°C to –4°C.

Example

When the external temperature is at its minimum –3°C the water temperature will be at the maximum required design temperature e.g. 45°C. The higher the external temperature is from the external winter temperature set-point the lower the mixed flow temperature will be. (As shown in Fig. 43).

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.5 SETTING UP THE FC CONTROLLER (COOLING)

Automatic Switching between operating modes heating/cooling

The REHAU FC controller is an independent Floor heating / Floor cooling control system. It is capable of switching the system from heating to cooling and back to heating automatically based on set parameters and climatic conditions. Thus being able to give an output demand signal to boiler, chiller or a reversible heat pump.

To enable this to happen, important information has to be programmed into the controller to enable the cooling criteria to be calculated by the controller and therefore operate to provide the comfort required when in cooling mode.

The activation of automatic cooling mode is influenced by the following input parameters:

1. Mean value of outside temperature
2. Actual value of outside temperature
3. Actual value of room temperature
4. Change of room temperature

The controller is supplied with pre programmed settings. In most case these settings will be suitable for the majority of heating / cooling applications. However, if adjustment of these parameters is required then follow the instructions below.

The only changes that maybe required in order to achieve project specific parameters and customer comfort conditions are:

(B) Cooling room thermostat Offset to heating set-point temperature.
(C) Night Setback Temperature (NSB).
(D) System operating mode selection.
(E) Rooms where Cooling is to be allowed.
(I) Minimum allowed system water temperature.
(J) Delay time between heating & cooling

Instructions to change the cooling settings

Using the up and down buttons on the FC locate the (A) symbol then press the (√). This will allow access into the cooling systems settings sub menu. The settings, their function and the function symbol are listed below.

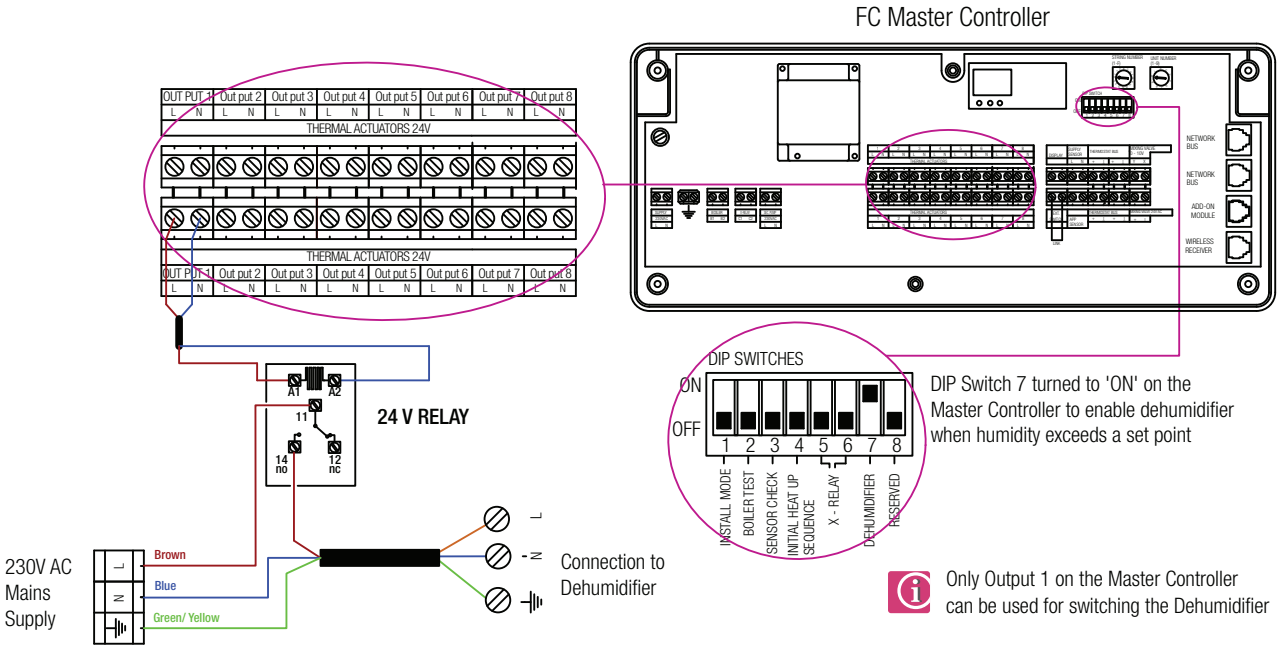
Function	Description	Factory Setting	To modify
(B) Offset to Day Temperature	This function prevents the need to adjust the temperature settings on the sensors from winter to summer temperatures. This allows all the connected sensors within the controller to have a positive offset temperature to the set day temperature set within the controller e.g. If the Controller has a heating day temperature set point is 21°C (see section 6.3.1) then in cooling mode the controlled cooling temperature within the space will be 24°C (21+ 3)	3°C	Using the (√) button to enable the adjustment or the required offset temperature and the up & down buttons to select the required temperature and then press the (√) button to confirm the offset temperature can be adjusted between 0°C to +6°C in .½°C increments.
(C) Night Setback Temperature (NSB)	The cooling setback function will operate at whatever NSB temperature set within the cooling control sub menu in the controller above the room set-point temperature when in cooling mode.	3°C	Using the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) button to confirm the offset temperature can be adjusted between +2°C to + 6°C in .½°C
(D) Calculated Dew Point	The display shows the calculated dew point temperature in °C based on the input data being received by the controller	Calculated based on humidity	This is a readout figure only and cannot be adjusted.
(E) Measured Maximum Humidity	The display shows the calculated humidity percentage based on the input data being received by the controller.	Calculated based on humidity	This is a readout figure only and cannot be adjusted.
(F) Status	The value will indicate if the system is in heating or cooling mode.	Read out only	-

Function	Description	Factory Setting	To modify
(G) System Mode Selection	This option will allow the function of the controller to be set the controller can be operated in the following modes 0 = **BMS** - Will only operate on demand from a BMS system 1 = **Auto** - the controller will dictate whether its in heating or cooling 2 = **Cooling** - The system is in permanent cooling 3 = **Heating** - The system is in permanent heating	3	Using the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) to confirm either (0,1,or 2).
(H) Cooling Allowed	The cooling allowed option will enable zones/rooms within the project to be including the Floor cooling function This gives flexibility throughout the project to isolate area when necessary e.g. in areas of high humidity like bathrooms and kitchens.	**All rooms selected to OFF (no Cooling) The room selection is based on the sensor channel number**	Using the (√) to enable the room selection and the up & down buttons to select the required room and then press the (√) to alter the ON (for cooling) or OFF (no cooling) selection. To escape this menu use the up button to and position the cursor to the OK icon then press (√).
(I) Distance from Calculated Dew Point	This is the adjustable safety temperature from dew point as calculated by the controller. The safety factor can be adjusted between +1°C to 5°C. When the controller detects that the room temperature is within the pre-set value above dew point then the controller will stop cooling with a delay time before fully closing the mixing valve actuator to prevent the formation of condensation on the surfaces.	2°C	To change this temperature use the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) to confirm.
(J) Exceeded Dew Point Temperature	To prevent the mixing valve closing due to short term raises in humidity there is an adjustable time allowance where the room temperature can be within the preset safety temperature above dew point for a short period.	10 mins (0 to 60 mins)	To alter this time setting use the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) to confirm.
(K) Dew Point Delay Time	Once the conditioned in (F & G) have been reached and therefore cooling has stopped by the closing of the mixing valve there is a further safeguard. This setting will dictate the time lag before the cooling system can operate again.	20 mins (0 mins and 120 mins)	To alter this time setting use the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) to confirm.
(L) Minimum Allowed Cooling Water Temperature	To prevent uncomfortable space conditions being experienced it is recommended that the floor surface temperature in the cooled zones should not drop below 20°C. To achieve this, the control system has a minimum allowed water temperature function. This would prevent water under the designed cooling water temperature from entering the floor cooling circuits. It should therefore be set to the cooling flow temperature shown on the REHAU design. Alternatively if the installation has been installed using REHAU TD sensors with floor sensors to all cooled zones then the system will respond to the floor temperatures.	14ºC	To alter this temperature setting use the (√) to enable the adjustment and the up & down buttons to select the required temperature and then press the (√) to confirm.
(M) Delay Time Between Heating & Cooling	To prevent uncomfortable space. This is the neutral zone when the system is not in cooling or heating operating mode. It is to prevent the system from cycling between heating and cooling mode during a short time period. A timed delay has to be programmed into the controller. This delay time will prevent the heating system becoming operational for a set time period after the controller has determined that the cooling criteria has no longer been satisfied.	8 hrs (15 mins to 72 hrs in 15 min intervals)	To alter this time setting use the (√) to enable the adjustment and the up & down buttons to select the required delay time and then press the (√) to confirm.

6.0 SYSTEM START UP AND OPERATING INSTRUCTIONS FOR HEATING & COOLING

6.5 SETTING UP THE FC CONTROLLER (COOLING)

6.5.1 Setting up Dehumidifier on the Master Connection



44. Typical Wiring Schematic for Dehumidifier requiring 230V signal using a 24V Relay

7.0 COMMISSIONING

The definition of commissioning, according to CIBSE (Chartered Institution of Building Services Engineers) is the advancement of an installation from static completion to working order to specified requirements.

The commissioning of a system is essential to obtain the design operating parameters of the FH system as set out by the system designer. Co-operation between all parties involved with the design and installation of the FH and control system is essential.

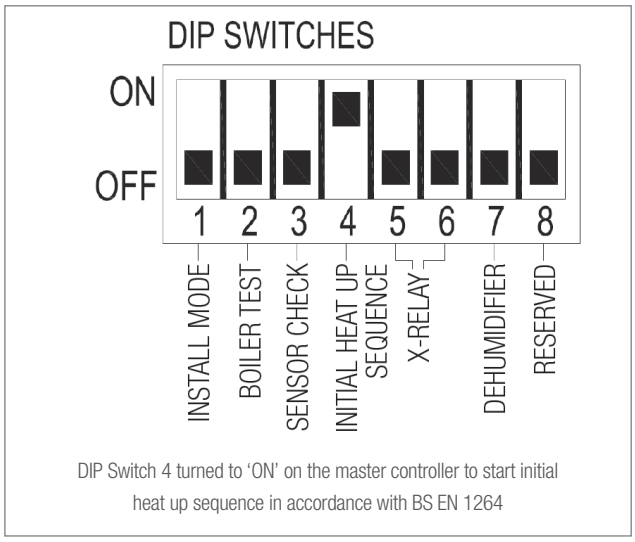
Sufficient time and resources has to be allowed for the full commissioning process of the installation to be completed.

7.1 Pre-commissioning Requirements

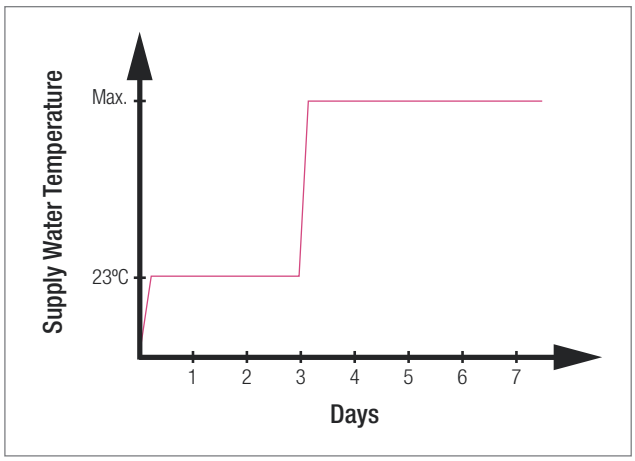
- Balance the flow rate through the circuit valves on the manifold.
- Confirm with the installer that the boiler commissioning has been carried out as instructed in the boiler manufacturer's installation and servicing instructions.
- Confirm with the installer that the chiller unit commissioning has been carried out as instructed and in accordance with the chiller manufacturer's installation and servicing instructions.
- Confirm correct operation of the system controls including the sequencing of the pumps, valves, boiler and chiller.

7.2 Automatic Initial Heating System Warm Up

FS/FC Master Controllers include a special "automatic heat up sequence", which allows the temperature of the supply water to be controlled via the mixing valve to allow correct compliance with BS EN 1264 Initial Heat Up.



DIP Switch 4 turned to 'ON' on the master controller to start initial heat up sequence in accordance with BS EN 1264



To start initial heat up sequence:

1. Set DIP-4 to "on".
2. This will set the supply water temperature at 23°C for three days and will fully open the entire manifold actuators.
3. Then for a further four days the water will be supplied at the maximum supply water temperature, as set in the REHAU FS/FC Master Controller menu and during this period the manifold actuators will remain fully open.
4. When the FS/FC Master Controller is operating in the commissioning function, this is indicated by the output LED's flashing in rotation and with the word "commissioning" flashing in the display.
5. The commissioning function time periods are paused if the power supply is interrupted.
6. Should you need to restart the commissioning from the beginning, switch DIP-4 to "OFF" and back to "ON".
7. To de-activate the function switch DIP-4 to "OFF".

This function conforms to BS EN 1264-4.

7.0 COMMISSIONING

7.3 Initial System Start Up for Cooling Systems

It is important that the initial heating system start up procedure (section 7.2, see page 55) is carried out prior to the operation of the cooling system. Even If the cooling system is to be commissioned in the summer months.

Confirm that the system operating input parameters listed below have been set into the FS Master Controller sub menu (see section 6.5)

(B) Offset to Day Temperature

(C) Night Setback Temperature (NSB)

(G) System operating mode selection

(H) Rooms where Cooling is to be allowed

(L) Minimum allowed system water temperature

(M) Delay time between heating & cooling

7.4 The Commissioning Team normally Consists of

- FH installer
- FH control system installer / electrician
- Boiler, chiller and main system controls installer / electrician
- M & E contractor
- Commissioning engineer

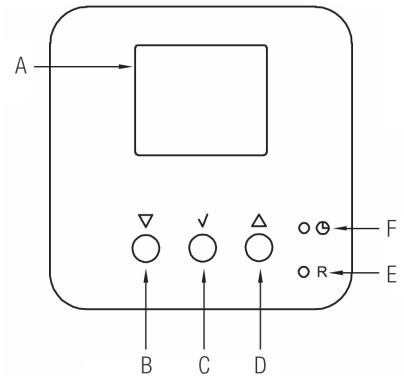
8.0 CT SET UP GUIDE

8.1 PROGRAMMABLE ROOM SENSOR, DOMESTIC HOT WATER, RADIATOR AND TWO STAGE CONTROLLER

CT2 → Programmable Room Sensor, CT2 / R → Radiator Controller, CT2 / HW → Domestic Hot Water Controller
CT2 / 2 → Two Stage Controller

The user guide applies for all the controllers mentioned above, with certain instructions only for specific controllers.

CT2 Programmable Room Sensor not to be used with FC Master Controller

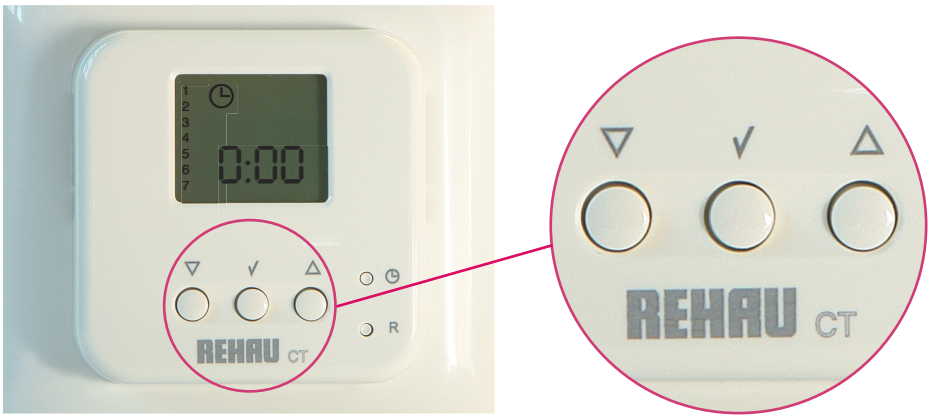


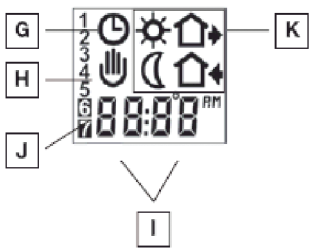
A:	B: ▽	C: √
Display	Adjustment down	OK - accept

D: △	E: R	F:
Adjustment up	Reset to factory setting	Pin button adjust of clock

45. REHAU CT2 Programmable Room Sensor/Controller showing front cover layout

The REHAU CT2 Programmable Room Sensor Controller has 3 main buttons to navigate: UP ▲, DOWN ▼ and ENTER √ (circled).

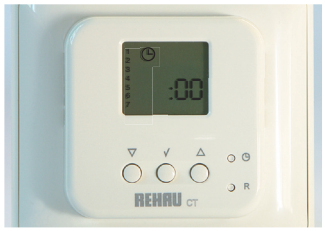




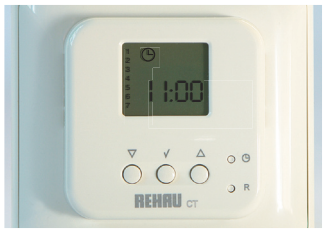
G:	H:	I:
Automatic mode	Manual mode	Time and Temperature

J:	K:	
Day Number	4-event symbol	
1 2 3 4 5 6 7	Wake	Out
	Night	Home

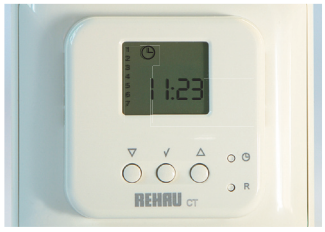
46. REHAU CT2 Programmable Room Sensor/Controller



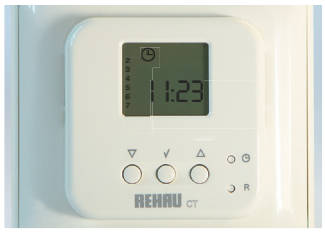
1. The time will have to be set as soon as the CT2 Programmable Room Sensor is switched on for the first time, the hour digits start to flash.



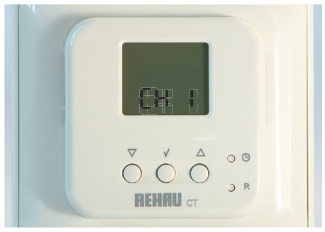
1.1a To change the hours on the clock, use the ▲ and ▼ to select the correct hour (24 hour clock is default) and then press √ .



1.1b Then the minutes will start to flash, adjust as above and press √ to confirm.

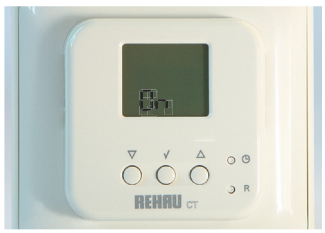


1.2 The day of the week then has to be set.
Number 1 on the top left of the screen will flash, select the correct day by using the up and down arrows. 1 is Monday, 2 is Tuesday....6 is Saturday, 7 is Sunday.
Press √ to confirm.

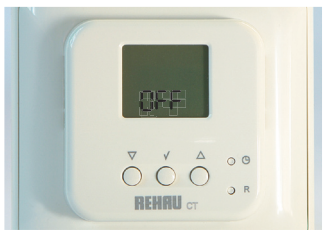


1.3 This shows the channel numbers for the following zones:-

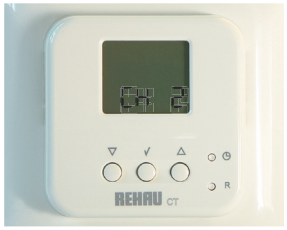
To set which channels the CT2 Programmable Room Sensor controls, press √ to select the first zone CH 1.



1.4 Use the UP and DOWN arrows to either select ON.

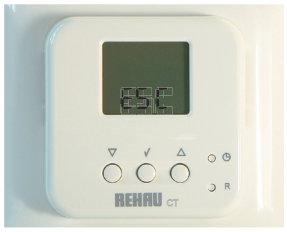


1.5 or OFF.
Press √ to confirm, then the next channel will appear.



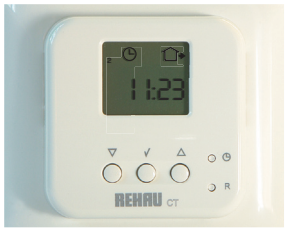
1.6 Repeat for each channel as desired.

To leave this menu, either go through all 14 channels and press ESC (below) or don't press any buttons for 10 seconds and it will revert to main screen.



1.7 To quit a sub-menu at any time, navigate the menus until you reach ESC and press √ .

N.B. Steps 1 - 3 are a requirement to enable the correct operation of the control system.
Steps 4 - 8 are optional.



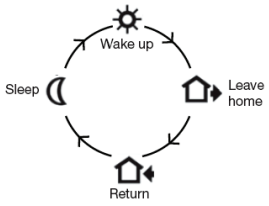
1.8 The date and time are now set.

N.B. Time has to be manually changed between BST and GMT.

To change the default time settings.

2. The default time events are shown below, if you do not wish to change them, proceed to step 3.

If you do wish to change them, follow step 2.



47. Event-clock mode

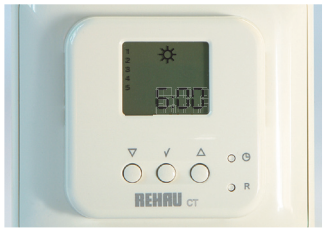
DAY 1-5	TIME	TEMPERATURE	
Day	06:00	21°C	50°C (DHW)
Out	08:00	15°C	30°C (DHW)
In	16:00	22°C	50°C (DHW)
Night	22:30	18°C	30°C (DHW)

DAY 6-7	TIME	TEMPERATURE	
Day	08:00	22°C	50°C (DHW)
Night	23:00	15°C	30°C (DHW)
4 Event Sequence	4.5.2		
High limit temperature		29°C (CT2 Programmable Room Sensor only)	
Low limit temperature		17°C (CT2 Programmable Room Sensor only)	
Scale	24hr/°C		

N.B. All event times must be in the same 24hr period.

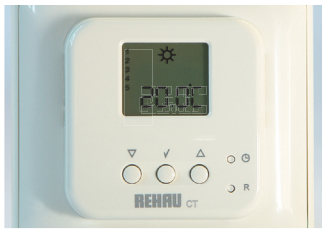
REHAU recommend a 2 hour warm up / cool down time for your underfloor heating, e.g. to be warm at 7am, start the first event, DAY, at 5am.

4-event clock mode/ automatic mode:		In automatic mode, the clock function symbol (◔) and one of the 4-event symbols (☼ ⌂▸ ⌂◂ ☾) will be indicated.
Comfort mode: ☞ △ ▽ ⧗ 5 secs.		**Temporary override** To temporarily override any temperature in the 4-event schedule program, press the UP (△) button once, to show the temperature in the display, and press UP (△) or DOWN (▽) again to increase or decrease the temperature. The display will flash for 5 seconds, and will then revert to the time. The override will operate until the next programmed event when the sensor will resume the automatic programme.
☞ √ √		**Cancel comfort mode** To cancel the temporary override, press the OK (√) button twice.
Manual mode: ☞ √ △ ▽ ⧗ 5 secs.		**Permanent override** During holidays, the scheduled 4-event program can be overridden. Press the OK (√) button, and then the UP (△) or DOWN (▽) button until the override temperature is set. The set temperature will remain in the display and the unit will now operate to this temperature permanently.
☞ √		**Cancel comfort mode** To cancel the permanent override state press the OK (√) button once, and the unit will resume automatic function.



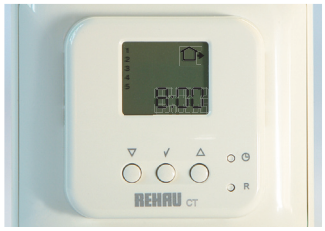
2.1a Hold the √ button for 3 seconds.
This screen will be displayed. This shows the start time of the first event, DAY, which is the first time the heating comes on.
If this is to be changed, use the UP and DOWN arrows like when setting the time.

If it is not to be changed, press √ twice to move on.

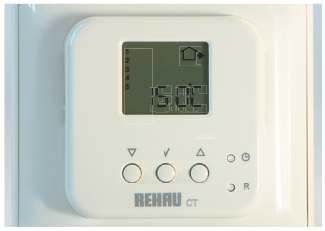


2.1b This is the temperature for the DAY event.
Adjust if required as above. If not press √ to continue.

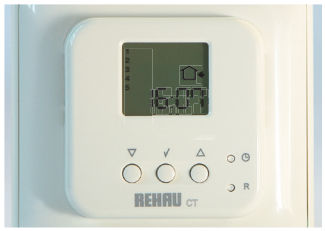
N.B. If no buttons are pressed for a while, the CT2 Programmable Room Sensor/Controller will revert back to the main screen and you will have to start again.



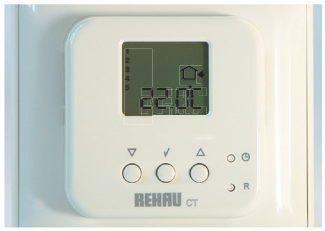
2.2a The time the second event starts - OUT.
Adjust if required as above. If not press √ twice to continue.



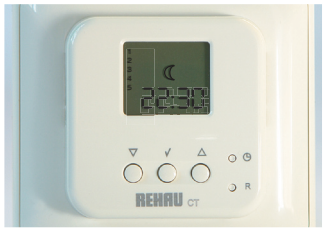
2.2b This is the temperature of second event - OUT.
Adjust if required as above. If not press √ to continue.



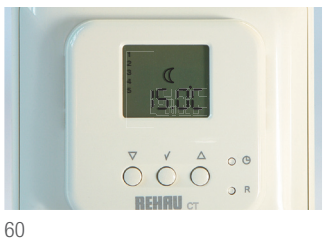
2.3a The time the third event starts - IN.
Adjust if required as above. If not press √ twice to continue.



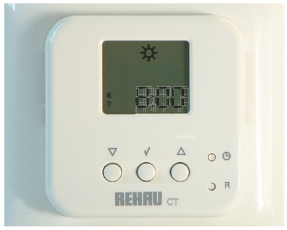
2.4b The temperature for the third event - IN.
Adjust if required as above. If not, press √ to continue.



2.5a The time for fourth event to start - NIGHT.
Adjust if required as above. If not press √ twice to continue.

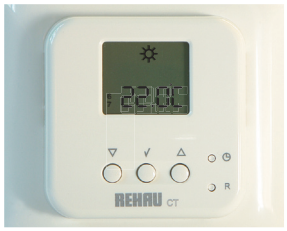


2.5b The temperature for fourth event - NIGHT.
Adjust if required as above. If not, press √ to continue.

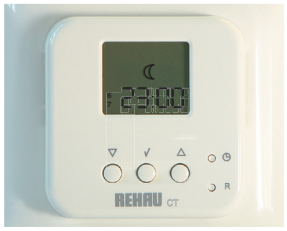


2.6a Days 6 and 7 (Saturday and Sunday) only have 2 events - DAY and NIGHT.
This screen shows the start time of day event.

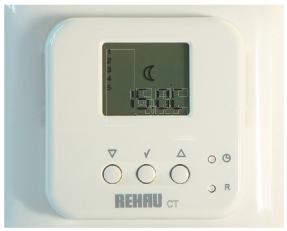
Adjust if required as above. If not press √ twice to continue.



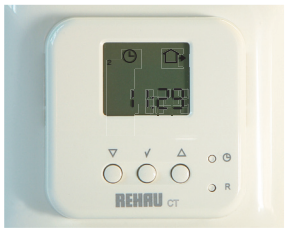
2.6b The temperature for DAY event at weekend.
Adjust if required as above. If not, press √ to continue.



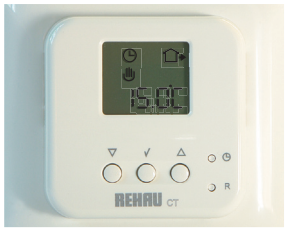
2.7a The time which the NIGHT event starts at weekend.
Adjust if required as above. If not press √ twice to continue.



2.7b The temperature for the NIGHT event.
Adjust if required as above. If not, press √ to continue.

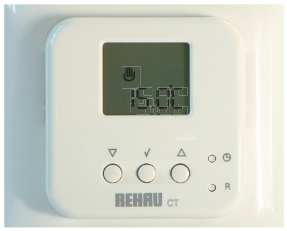


2.8 Once the settings are completed, the CT2 Programmable Room Sensor/Controller returns to the standard screen, showing time, day and current event.



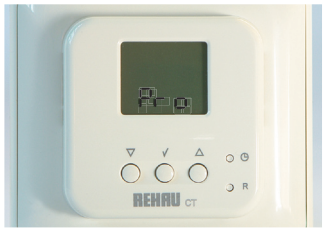
3. Temporary Override (to change current temperature temporarily)

Press the UP button once, the temperature then flashes.
Adjust to desired temperature with UP and DOWN buttons. The display then flashes for 5 seconds and then reverts back to main screen.
To cancel, press √ twice.



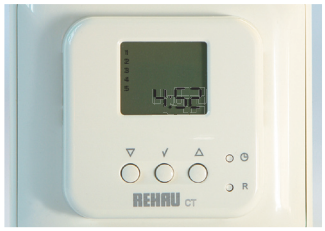
3.1 Permanent Override (e.g. occupants go on holiday)

Press √ on main screen.
Use UP and DOWN buttons until desired temperature reached. Press √ to confirm.
The display will remain on the override temperature until it is cancelled.
To cancel, press √ once.

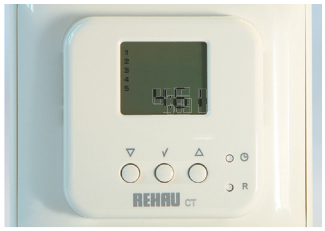


4. **Changing event sequence over different days (if required)**

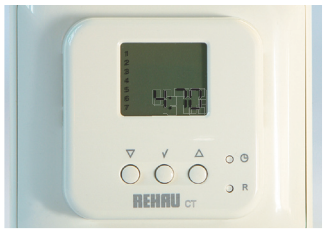
Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press √ on Pro.
The 5 possible sequences below can be scrolled through and selected by √ .



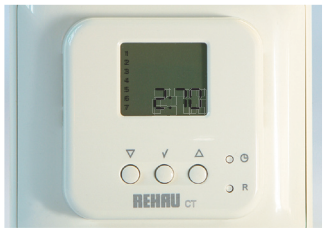
4.1a 4 events on 5 days, 2 events on 2 days (default).



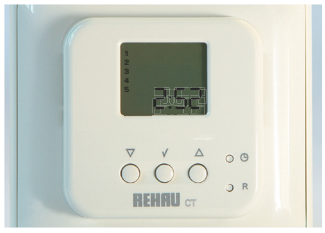
4.1b 4 events on 6 days, 2 events on 1 day.



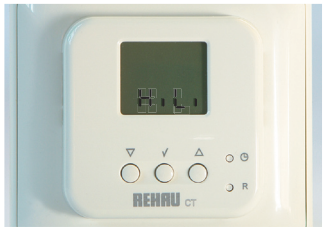
4.1c 4 events for 7 days.



4.1d 2 events for 7 days.

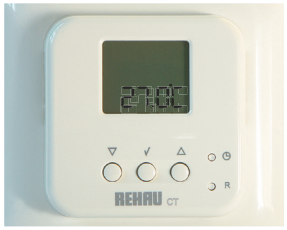


4.1e 2 events for 5 days, 1 event for 2 days.



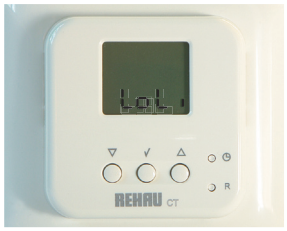
5. **Setting Floor Sensors (only available on CT2 Programmable Room Sensor)**

Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press on √ on HiLi.

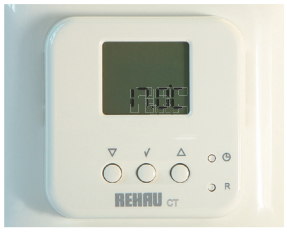


5.1 Adjust maximum floor sensor temperature with UP and DOWN buttons, press √ to confirm.

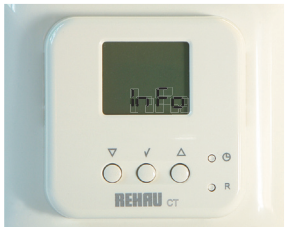
N.B. Only a maximum OR minimum floor sensor can be fitted to each CT2 Programmable Room Sensor, not both.



5.2 Select LoLi if minimum floor sensor fitted.

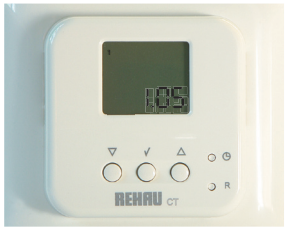


5.3 Adjust minimum floor sensor temperature as above.

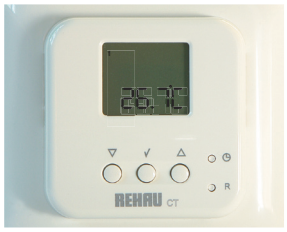


6. To See Current Sensor Info

Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press √ on InFo.

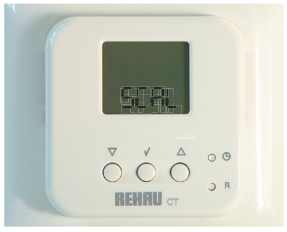


6.1 The first screen shows the software version.



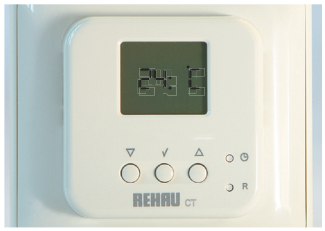
6.2 Press DOWN to show current room temperature.
Press DOWN again to show floor temperature (if floor sensor fitted).
Press √ to return to main screen.

N.B. No values can be changed in InFo.



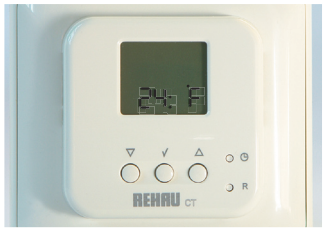
7. Changing the Scale from °C to °F and 12-24hr

Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press √ on SCAL.
This allows you to change the clock and the temperature units.

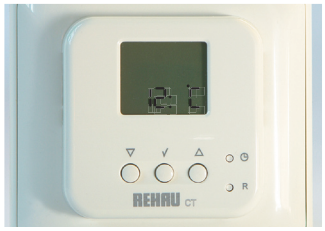


7.1 Press UP and DOWN to scroll through options and √ to select desired scale.

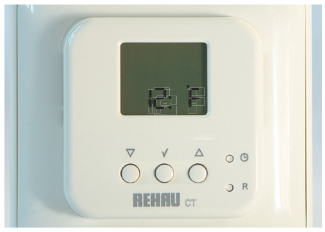
The first is 24 hour clock and temperature in celsius.



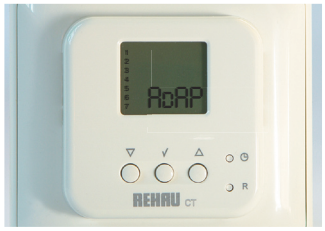
7.2 24 hour clock and temperature in fahrenheit.



7.3 12 hour clock and temperature in celsius.

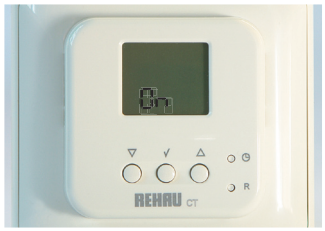


7.4 12 hour clock and temperature in fahrenheit.

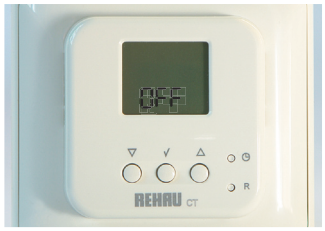


8. Turning on Adaptive function ensures that the room will reach the correct temperature at the desired time.

Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press √ on ADAP.

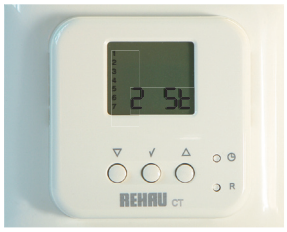


8.1a Use the UP and DOWN arrows to either select ON.



8.1b or OFF.
Press √ to confirm, then the next channel will appear.

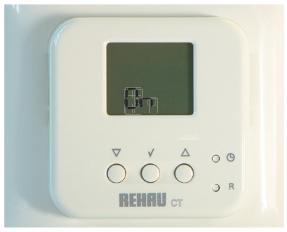
Below only required for CT2 / 2 Controller (Two Stage Controller)



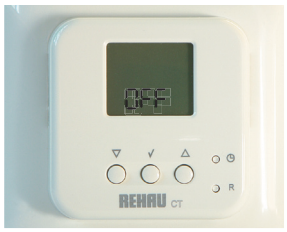
9. **To change advanced settings on the two stage controller**

Advanced settings on two stage controller. Using these settings, the secondary heat source could be turned on if the room does not reach the correct temperature in the desired time. An example would be to bring the second stage if temperature has not reached 2°C of the set point within 30 minutes

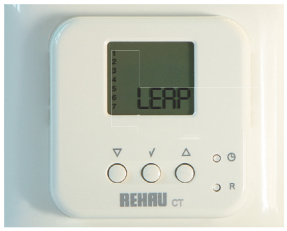
Hold UP and DOWN buttons to reach sub-menus.
Scroll through and press √ on 2 ST



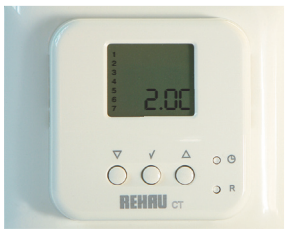
9.2a Use the UP and DOWN arrows to either select ON.



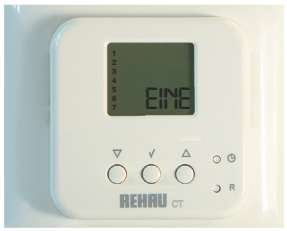
9.2b or OFF.
Press √ to confirm, then the next channel will appear.



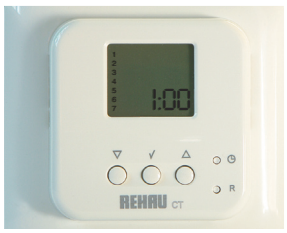
9.3 'LEAP' will start to flash on the screen, press √ to confirm.



9.4 Use the UP and DOWN arrows to set the temperature between 0 to 10°C, press √ to confirm.



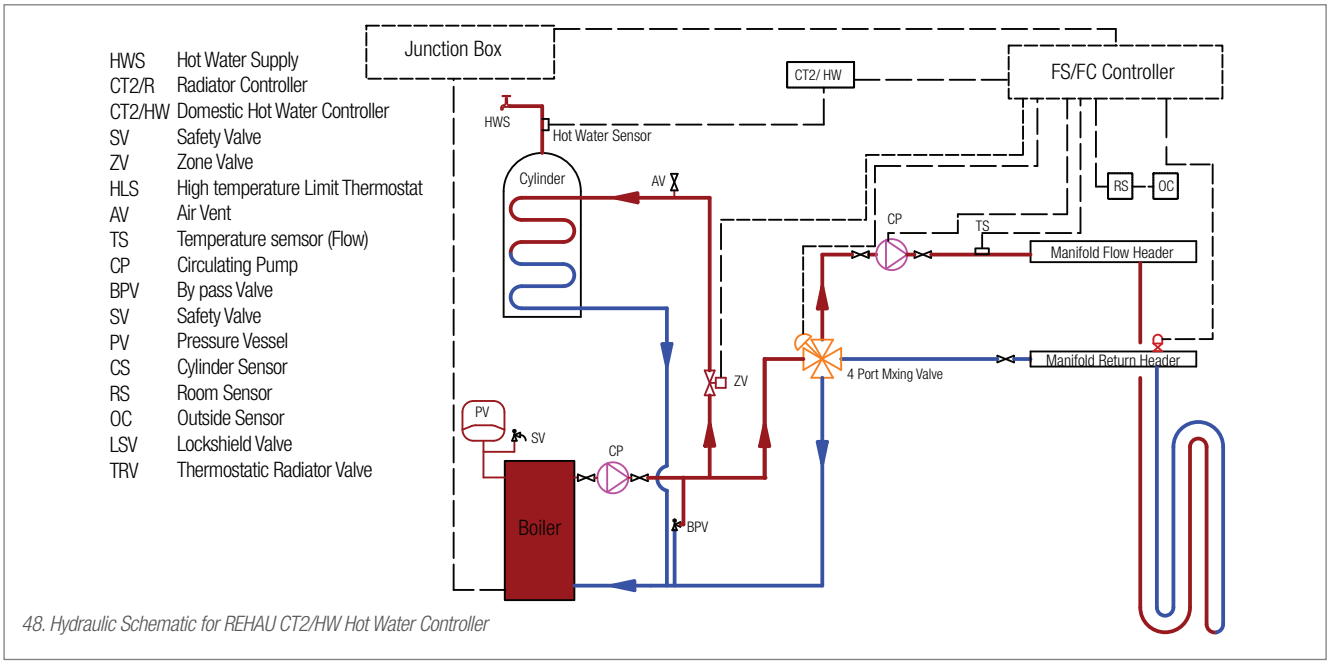
9.5 'EINE' will start to flash on the screen, press √ to accept.



9.6 Use the UP and DOWN arrows to set the time between 0 to 2hrs, press √ to confirm.

9.0 DOMESTIC HOT WATER (DHW), RADIATORS AND TWO STAGE CONTROLLER

9.1 DOMESTIC HOT WATER (DHW)



48. Hydraulic Schematic for REHAU CT2/HW Hot Water Controller

Working Principle

The REHAU CT2/HW is provided with a remote flow temperature sensor which is strapped on to the domestic hot water supply pipe from the cylinder (within 150mm of top of cylinder). The temperature of the hot water is controlled by REHAU CT2/HW, which continuously compares the required water temperature with actual water temperature measured by the flow temperature sensor. If the water temperature is too low, it will signal the zone valve (wired via a 24V Relay into the Master Controller) to open and start the boiler there by allowing hot water to flow through the primary coil.

Programming

The programmable function allows for two timed periods per day when the water temperature is generated up to the level set within the controller. Outside of these periods a second temperature can be set, as a back up, below which the stored hot water is not allowed to fall, outside of the timed periods. The actual temperature being measured by the sensor is displayed in the controller's "info" menu.

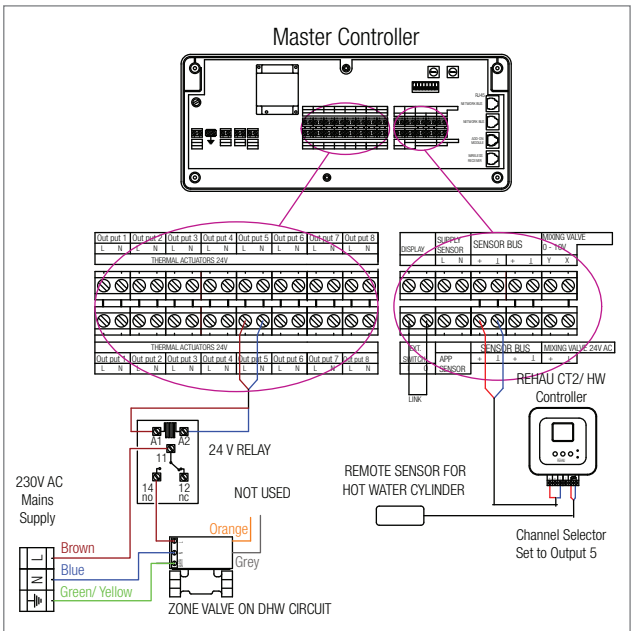
Default Settings**	Description
50ºC*	Hot water generation
30ºC	Back up water temperature not allowed to fall below the set temperature

* This may be reduced to a lower setting if solar generation of hot water is employed, so that best use is made of the "free" energy produced by the solar heating

** For altering the default settings please refer to section 8.0

Installation

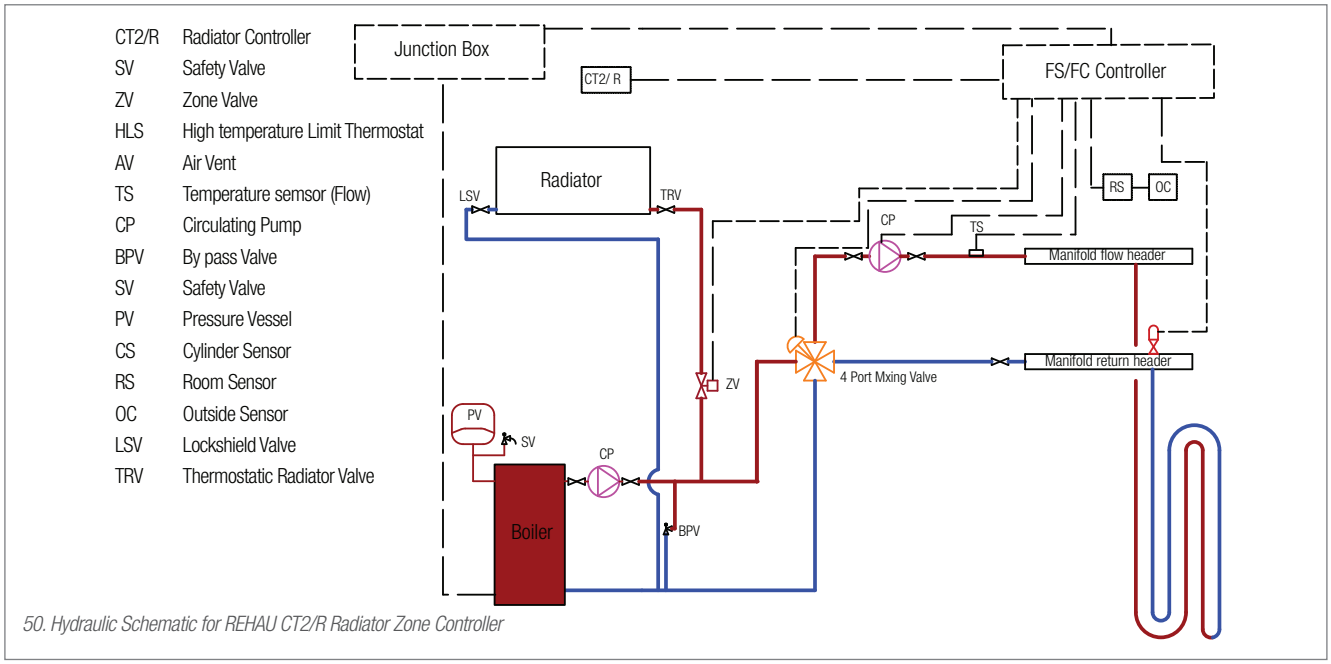
A 2-port zone valve is installed on the primary supply from boiler to storage cylinder, and this is wired to a 24V Relay, which is controlled by the output of the REHAU FS/FC controller. The channel output number is set in the REHAU CT2/HW controller.



49. Wiring Schematic for REHAU CT2/HW Hot Water Controller and 24V Zone Valve

9.0 DOMESTIC HOT WATER (DHW), RADIATORS AND TWO STAGE CONTROLLER

9.2 RADIATORS



50. Hydraulic Schematic for REHAU CT2/R Radiator Zone Controller

Working Principle

Like traditional control of radiator circuit, REHAU CT2/R controls the temperature of a circuit or Zone of Radiators that are hydraulically independent from an underfloor heating system. The REHAU CT2/R continually compares the required room temperature with the actual room temperature, if the temperature is too low, it will signal the zone valve (wired via a 24V Relay into the Master Controller) controlling the radiators to open and start the boiler, thereby allowing hot water to flow through the circuit.

Programming

The default programmable function allows for two timed periods per day when the temperature of the zone is required level and allowed to fall to a lower level outside these periods. The actual zone temperature being measured by the sensor is displayed in the unit's "info" menu.

The control of multiple rooms is possible, contact REHAU sales office.

If thermostatic radiator valves are employed, these can be used for individual room control, and the REHAU CT2/R can be used as a timing device with the high temperature setting used for maximum limiting and the low temperature setting for frost protection.

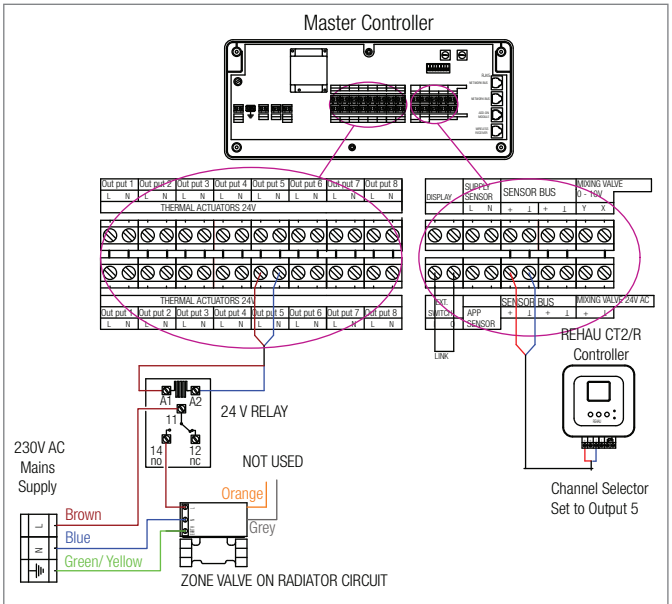
If the whole heating system is served by radiators, and no underfloor heating is used, then standard REHAU CT2 sensor should be used, which will start the secondary pump, for circulation around the system.

Default Settings*	Description
21ºC*	Occupied - Zone temperature
17ºC	Setback - Zone temperature

* For altering the default settings please refer to section 8.0

Installation

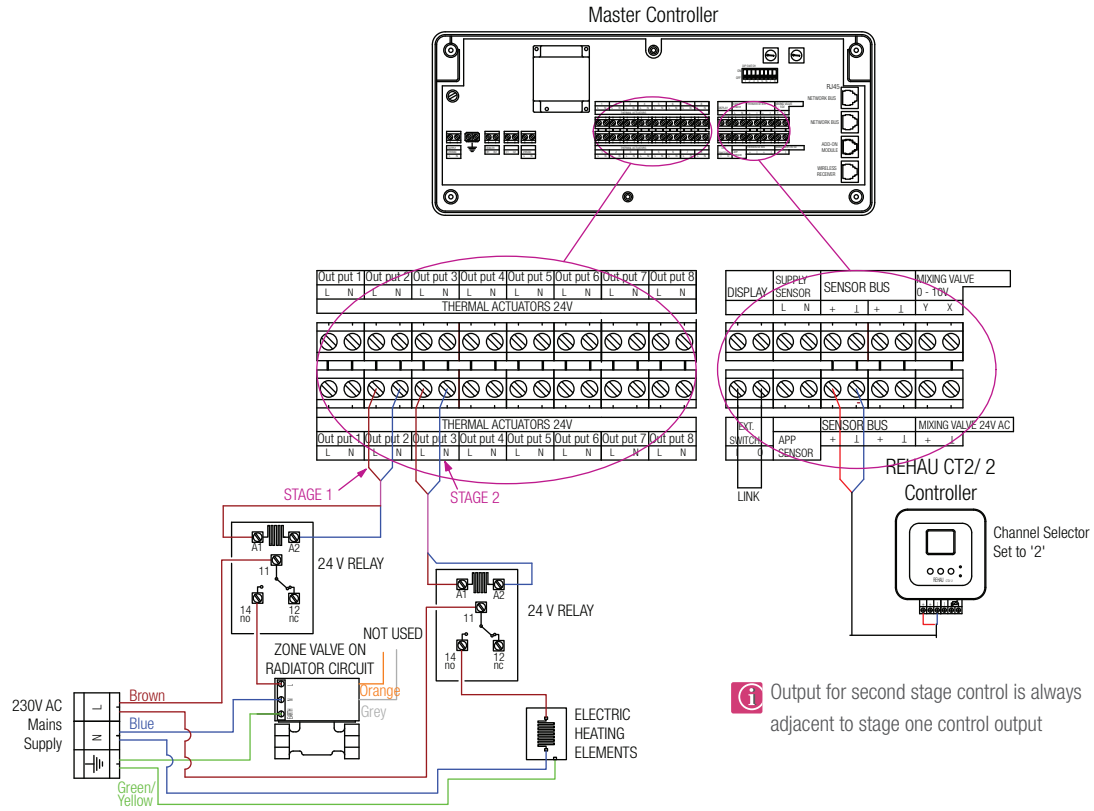
A 2-port zone valve is installed on the primary supply from boiler to the radiators and this is wired to 24V Relay, which is controlled by the channel output of the REHAU FS/FC controller. That channel output number is then set in the REHAU CT2/R controller.



51. Wiring Schematic for REHAU CT2/R Radiator Zone Controller

9.0 DOMESTIC HOT WATER (DHW), RADIATORS AND TWO STAGE CONTROLLER

9.3 TWO STAGE ROOM TEMPERATURE CONTROLLER



52. Wiring Schematic for REHAU CT2/2 Two STAGE Room temperature Controller

Working Principle

REHAU CT2/2 provides two stage control of a designated area or room which may be part of an underfloor heating system. These units are used where a secondary heat source is employed to boost the temperature within the area if the conventional heating system is not powerful enough. For example, a conservatory, which features a considerable glass area, can benefit by the switching of an additional heat source i.e. electric radiators on very cold days when the normal system cannot achieve the required temperature level.

A further application is where a heat pump is used to create the normal system hot water, but on very cold days this may not be sufficient to achieve the required temperature. The second stage can be used to enable a back up boiler or immersion heater.

When a timed event occurs to raise the room temperature a function within the controller allows the normal heating system to initially try to achieve the temperature. If after a period of time (x) it has not warmed the space to within (y) degrees of the required level, the second output is enabled. Once the temperature has been achieved, the second stage switches off, but if the temperature should then fall to below (y) degrees of that required, the second stage is re-started after a similar delay period. Within the advanced menu section of the controller, the 'y' setting can be adjusted by the client or installer from 0ºC to 10ºC, and the 'x' setting can be adjusted from 0-2 hours, so an example would be to bring on the 2nd stage if the temperature has not reached within 2ºC (y) of the set point after (x) 30 minutes.

Programming

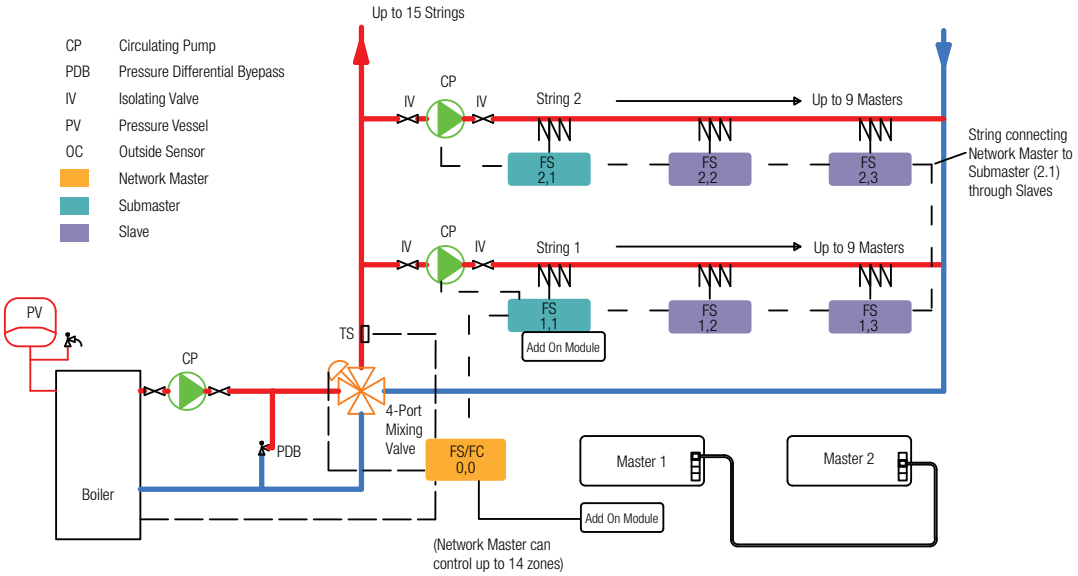
4 event time and temperature programming is similar to that of standard CT2 Programmable Room Sensor. In addition it also includes programming for second stage. An "optimum start" facility (adaptive function) can also be enabled when the unit will calculate the ON time, to achieve the required temperature by the start of the programmed period.

Installation

The Two Stage Controller is installed as part of the FS/FC Master Controller and set to a channel number, e.g. Channel 3. The normal heating valve is connected to output 3. Output 4 on the Master Controller becomes the second stage output, and must not be used for any other function. The electrical capacity of the output is 2 amps, so if electric elements are being used, a relay or contractor should be employed.

10.0 SPECIAL FUNCTIONS

10.1 NETWORKING MULTIPLE CONTROLLERS



53. Hydraulic Schematic for Networking of Multiple Controllers

In larger buildings with more than 14 zones where multiple manifolds are utilised, it is possible to use multiple masters to create a single network. One master must be defined as the "network controlling master" by setting both dials to zero (see table below).

Using more than one secondary pump

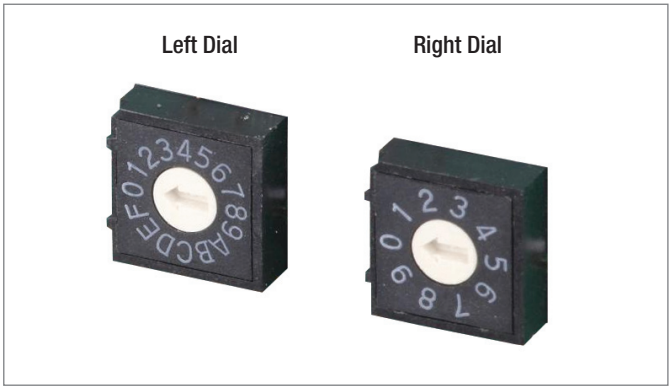
1. If more than one secondary pump is used, a separate string should be created for each pump (see Fig. 53). On the first string all left hand dials in the slaves must be set to 1, and the right hand dial should be set in sequence from 1 to 9. On the second string of masters/ slaves all left hand dials should be set to 2 and the right hand dials again should be set in sequence from 1 to 9. This numbering can be continued for up to 15 strings.

2. All main controllers are interconnected using special cable via the RJ 45 socket 1 or 2.

3. RJ 45 connection of string 1 to string 2 etc., can be achieved via string 1 slave to string 2 submaster or string 1 slave to string 2 slave as shown in Fig.53.

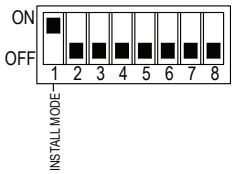
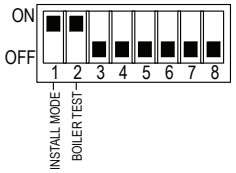
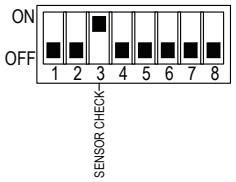
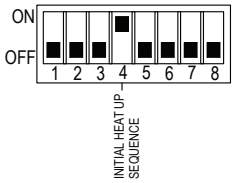
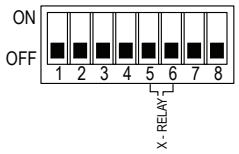
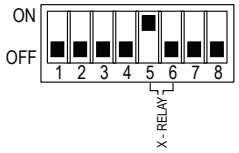
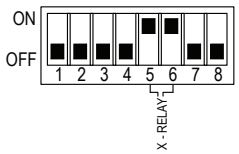
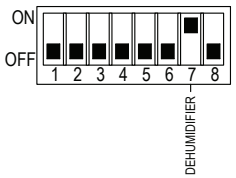
4. An FS Master Controller can be used as the "network controlling master" for central mixing control of supply water and boiler switching.

Master and Slave	Left dial set to	Right dial set to
Network Controlling Master	0	0
String 1 Submaster	1	1
String 1 Slave	1	2 to 9
String 2 Submaster	2	1
String 2 Slave	2	2 to 9
Up to String 15 Submaster	1 to F	1



10.0 SPECIAL FUNCTIONS

10.2 DIP SWITCHES

DIP Switch		Function	Description	DIP switches (located on the master controller)
1		Turn on to activate install mode	Increase temperature on sensor in room 1, this would activate actuator on output 1 and will open after 1-3 minutes, UFH pump to turn on and mixing valve to open; Turn off to deactivate	
1 & 2		Turn on to close boiler relay	This closes the boiler start relay contacts for 1 minute; Turn off to deactivate	
3		Turn on to activate sensor mode	Power light start blinking; each red channel light on master should now be lit if a room sensor is present on that channel. Turn off to deactivate	
4		Turn on to activate initial heat up sequence	Indicated by Output LED's flashing in rotation with word 'commissioning' flashing in the display. To restart Turn OFF and Turn ON DIP - 4. (Conforms to BS EN 1264 - 4). To be turned on for 7 days	
5	6			
Off	Off	Main Pump	Where a boiler primary pump is required to be switched on from the master, the X relay output can be used for this purpose. This relay will be activated 10 seconds after the UFH circulating pump has started	
On	Off	High limit zone valve	This function is used where an additional protection is required to prevent boiler water entering the underfloor system. When the system is off or when the supply water exceeds 65°C. An additional flow water temperature sensor (ETF-1899A) and a zone valve are connected (Fig. 25, see page 38)	
On	On	Cooling device or module alternative	The relay output can be used to provide a volt free signal to a heat pump or to a K-MOD switching module where a chiller is utilized to provide the cooling water. The relay output is always on in cooling mode and off in heating mode	
7		Turn on for Dehumidifier	If a dehumidifier is being used it can be connected via a relay using number 1 output on the master and setting DIP-7 to "on", the output given is 24V ac. Hence Channel 1 cannot be used for room temperature control	

10.0 SPECIAL FUNCTIONS

10.3 HOLIDAY OVERRIDE FUNCTIONS

Dependent upon the control system configuration it is possible to override all the automatic functions of the control system with a single function.

This action can be used for holiday periods (e.g. to set the whole system into a frost protection mode), or to temporarily override all the temperature control of the system.

Below are set out two options.

Option 1

CT2 Programmable Room Sensor set to Channel' 0'

Channel 0 can be used for REHAU CT2 Programmable Room Sensor controlling a group of slave thermostats but do not control actuators. The position of these thermostats should be somewhere central or convenient within the building

Setting this thermostat to Channel 0 will control the time and temperature for the connected group of thermostats but the REHAU CT clock thermostat itself will not control an output.

Option 2

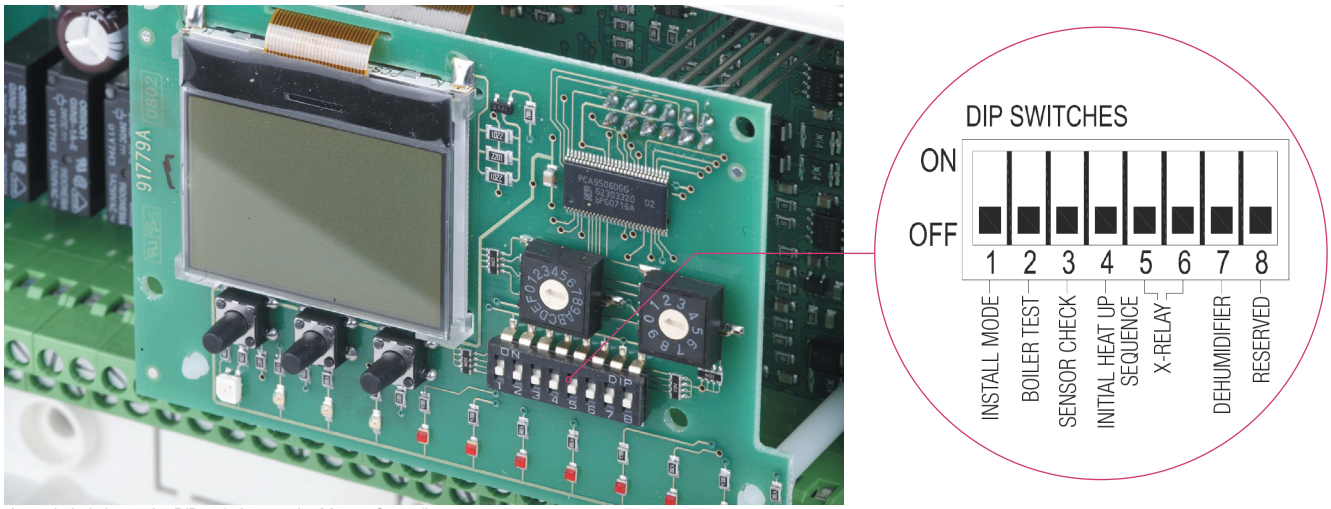
Permanent Override

If the system if fitted with REHAU CT2 Programmable Room Sensor the scheduled 4-event program can be overridden (refer to permanent override on page 59).

10.0 SPECIAL FUNCTIONS

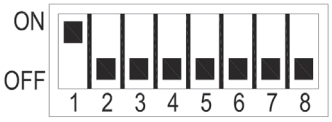
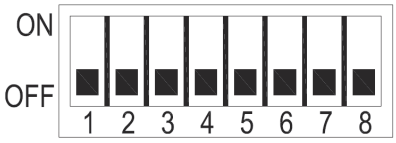
10.4 CHECKING CONTROL SYSTEM OPERATION

After setting the channels, it is possible to check the entire control system.



Area circled shows the DIP switches on the Master Controller

System check procedure

1. Sensor check:	
a. Switch on DIP-3 to activate sensor check - power light starts blinking. b. Each red channel light on the Master Controller should now be lit if a Room Sensor is present on that channel. c. Switch off DIP-3 to de-activate sensor check - power light stops blinking.	 DIP Switch 3 turned to 'ON' on the Master Controller to enable 'Sensor Check'
2. Install mode:	
a. Turn all adjustable temperature settings on the Room Sensors to minimum. b. Switch on DIP-1 on the Master Controller to activate install mode (Install mode will be active for 2 hours). c. Turn the temperature setting on the adjustable Room Sensor in room 1 to maximum. The red channel 1 light should be lit and the actuator on output number 1 will be activated. d. After 3 mins 10 secs UFH pump and mixing valve output will operate. e. Repeat step 2c on all rooms. **Note 1:** Install mode will only be active for 2hrs, after this it returns to normal control if left on. **Note 2:** If the Room Sensor is of a wireless type, a delay of up to 5 minutes may occur before the channel light becomes illuminated. **Note 3:** If DIP-5 and DIP-6 are off this enables main pump after 10 secs.	 DIP Switch 1 turned to 'ON' on the Master Controller to enable 'Install Mode'
3. Boiler test:	
a. Switch on DIP-1 & 2. This closes the boiler start relay contacts for 1 minute.	 DIP Switch 1 & 2 turned to 'ON' on the Master Controller to enable 'Boiler Test'
4. To end all tests:	
a. Switch off DIP-1 to deactivate sensor check. b. Switch off DIP-2 to deactivate boiler test. c. Set all Room Sensor dials to centre position i.e. zero. d. Room Controllers recommended to 21˚C. e. Set all override switches to automatic position (clock symbol).	
5. The system is now operating automatically.	

11.0 TROUBLESHOOTING AND ERROR/FAULT MESSAGES

11.1 TROUBLESHOOTING

Problem	Possible cause & Solution
Channel light is not coming on (When in Server Check (DIP3) Mode)	Make sure the power light is blinking. If not then put DIP-3 to ON position. 2-wire bus may be incorrectly connected. Voltage at each Room Sensor should not be lower than 4.0V (check for + & - continuity and short circuits). For Wireless Room Sensors, please check that the batteries have been inserted correctly. Have the Wireless Controllers/ Sensors been initialised. For Wireless Room Sensor check that the REHAU RC (receiver) is correctly connected. For channel 9-14, is the Add On Module correctly connected to the Master Controller. Make sure the Room Sensor in that room is set to the correct channel number. The channel selector on the Room Sensor may be slightly out of position, try rotating and set it again.
(When in Install mode (DIP1), when the CT2 Programmable Room Sensor is activated (set to maximum))	Master Controller is not in install mode - after 2 hours the Master Controller automatically de-activates install mode - please reset the DIP-1. Make sure the Room Sensor in that room is set to the correct channel number (two Room Sensors could be crossed over).
The actuator on the manifold has not opened after 3 minutes.	Check the red channel light is illuminated. The actuator for the room is not connected to the correct output on the Master Controller. Bad electrical connection between actuator and terminals. Actuator may be faulty or manually locked.
UFH Pump not starting in install mode	Bad electrical connection between pump and terminals. Install mode is not activated. Pump may be faulty.
Output relay for Main pump, Cooling, High limit valve or other attached device, not starting in install mode	Incorrect connection to device (output relay has volt free contacts, see FS Master Controller wiring diagram for correct connection). Bad electrical connection between terminals and attached device. Install mode is not activated. Attached device may be faulty.
Boiler does not fire (LED lit)	Incorrect connection to device (output relay has volt free contacts, see FS Master Controller wiring diagram for correct connection). Bad electrical connection between terminals and attached device. Install mode is not activated. Attached device may be faulty.
(LED not lit)	Timing sequence delay is activated. FS Master Controller only - mixing valve not open above 20%. No heat demand from Room Sensors. Master Controller is in cooling mode.

11.0 TROUBLESHOOTING AND ERROR/FAULT MESSAGES

11.1 TROUBLESHOOTING

Problem	Possible cause & Solution
Mixing valve does not operate correctly (When in install mode)	Incorrect connection, see master wiring diagram for correct connection. Valve/actuator assembly is incorrect. Actuator is faulty. Check what happens if sensor and/or outdoor module is missing.
(Valve cycles between open and closed in normal operating mode)	Valve may be oversized. Supply Limit sensor may be subject to heat migration. Upstream water temperature is excessively high (these problems may be corrected by changing PI settings – please refer to the REHAU Intelligent FS/FC Heating/Cooling Controls, Technical and Installation Manual).
Room is too cold. (After running for at least 48 hours)	The Room Sensor is placed in a position that does not represent the general temperature in the room. E.g. mounted on external wall or near an extraneous heat source. If the room is controlled by a CT2 Programmable Room Sensor, check that the time and temperatures are set correctly. If the Room Sensor has got an override switch (TM or TD), the switch may be set in the “off” or “night” position. For rooms with floor sensors, the maximum floor limit setting could be preventing the room reaching the desired temperature. Insufficient heating capacity of the system. Bad insulation creating large heat loss.
Room is too hot (After running for at least 48 hours)	This could be caused by draughts within the wall cavities. The Room Sensor is placed in a position that does not represent the general temperature in the room. If the room is controlled by a CT2 Programmable Room Sensor, check that the time and temperatures are set correctly. If the Room Sensor has got an override switch (TM or TD), the switch may be set in the “day” position. For rooms with floor sensors, the minimum floor limit setting could be increasing the room temperature above the desired setting. Solar gain or extraneous heat source.

11.0 TROUBLESHOOTING AND ERROR/FAULT MESSAGES

11.2 ERROR/FAULT MESSAGES

During normal operation the green power LED will be ON when the Master Controller is energised. The red output Channel LED's (1 to 8 on the Master Controller, and 9 to 14 on the add-on module) will indicate if the channel output relay is **ON/OFF**.

An error / fault message is shown by flashing the green power LED or one of the 8 red output Channel LED's. From the number of flashes on any one LED, the problem can be diagnosed, and identified from the following:

The error number will be indicated by the number of flashes, with a pause of less than a 1/2 second between the flashes. The indication will be followed by a pause of 2 seconds, following which the sequence will be repeated. The failure code can also be seen in the service menu on WLM-FS MASTERS (submenu 2).

11.2.1 Flashing Power LED (green)

Flashes	Description	Corrective action
1 Flash	One or more Room Sensors, room controllers, WLH, WLAC that are set to channel 0 or channel 15 are no longer sending data to the Master Controller. If the Room Sensor is of the WIRELESS type, the error/fault message could be an indication that the power has failed, and that the internal battery of the Room Sensor needs to be replaced.	The fault is corrected by replacing the Room Sensor. The Master Controller will need to be HARD RESET (see below).
2 Flashes	One or more Room Sensors have been set to a channel number which does not exist in the system. For example, the message will occur if the units are set to channels 9-14 and the required Add On Module are not found in the system.	The error is corrected by setting the channel number of the Room Sensor to a channel that does exist within the installed Master Controller/Add On Module system.
3 Flashes	Application sensor defect.	The fault is corrected by changing the temperature sensor. If the sensor has been removed deliberately to change the operation of the system, follow the HARD RESET instruction below.
4 Flashes	The Outdoor Compensation Module (OC) is defective.	The fault is corrected by changing the Outdoor Compensation Module. If the module has been removed deliberately to change the operation of the system, follow the HARD RESET instruction below.
5 Flashes	The external Supply limit sensor (type ETF-1899A) is defective.	The fault is corrected by changing the temperature sensor. If the sensor has been removed deliberately to change the operation of the system, follow the HARD RESET instruction below.
6 Flashes	Internal overheating.	The Master Controller has its own internal safety temperature protection system. The problem is corrected by improving the ventilation around the Master Controller module.
7 Flashes	Defective internal overheat sensor. The Master Controller will control as normal, however the protection against internal over heating is no longer active.	The fault can only be corrected by replacing the Master Controller module.
8 Flashes	The communication to the Add On Module has been lost.	The fault is corrected by re-establishing the connection to the Add On Module or by changing the Add On Module if it is defective - or if it has been deliberately removed, with a HARD RESET.
9 Flashes	Indicates total number of input units exceeded.	Please refer to factory or your local service engineer.
10 Flashes	No connection to wireless receiver REHAU RC.	
11 Flashes	Step 2 on 2-step controller REHAU CT2/2 is used by another Room Sensor/ Controller.	

Only one error/fault condition can be shown at a time. If more than one error occurs, they will be prioritised in the sequence of flashes.

11.0 TROUBLESHOOTING AND ERROR/FAULT MESSAGES

11.2 ERROR/FAULT MESSAGES

11.2.2 Flashing Output LED (red):

The appropriate output channel LED can flash, indicating that the Room Sensor or Controller on that channel has a fault/error. The failure code can also be seen in the service menu (submenu 2a).

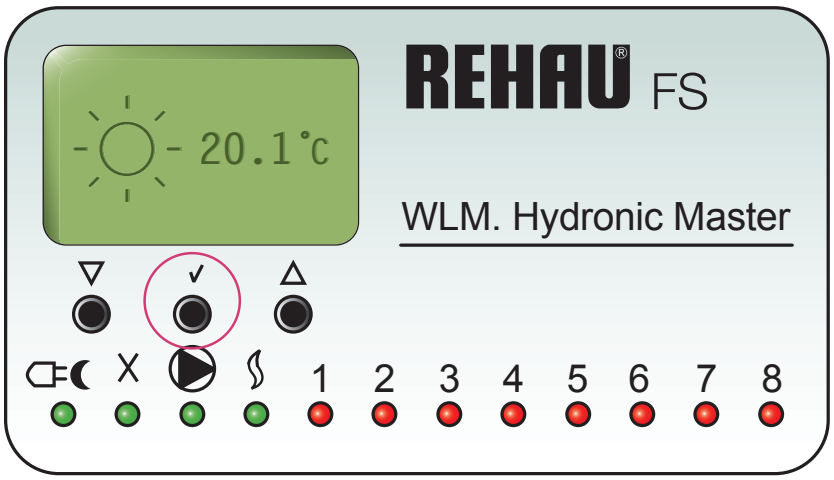
Flashes	Description	Corrective action
1 Flash	The Master Controller has lost communication to the Room Sensor.	The fault is corrected by re-establishing the connection to the Room Sensor and the fault condition will be automatically reset once correct communication is resumed. If the Room Sensor is defective and has to be changed, or if it has been deliberately removed, it is necessary to make a HARD RESET. If the Room Sensor is of the WIRELESS type, the error/fault message could be an indication that the power has failed, and that the internal battery of the Room Sensor needs to be replaced.
2 Flashes	The internal sensor in the Room Sensor/Controller is defective.	The fault can only be corrected by replacing the Room Sensor/Controller. Remember to make a HARD RESET after installing the new Room Sensor/ Controller.
3 Flashes	The limit sensor on the Room Sensor/Controller is defective.	Replace the faulty sensor. Reset is NOT required.
4 Flashes	Defective REHAU CT2 Programmable Room Sensors/Controllers.	If a CT2 Programmable Room Sensor operating a group of Room Sensors becomes defective, the remaining Room Sensors will continue control within the maximum and minimum limits programmed into the Master Controller.
5 Flashes	Two or more CT2 Programmable Room Sensors/Controllers are trying to control this output.	Check “AREA” setting on the CT2 Programmable Room Sensor.

11.2.3 Voltage Measurements

The following information should be useful to electrical installers who, with a multi meter, can measure voltages on the terminals of the Master Controller Modules and Room Sensors. Please check these measurements first, in the event of an apparent malfunction.

Voltage measured across	Value	Description
Sensor Bus (measured at any point within the Bus)	4.69v to 4.99v dc	Indicates a good bus
	Less than 4.69v dc	Indicates that one sensor may have polarity reversed
	Above 4.99v	Theoretically impossible
External switch (measured across the terminals)	11.5 to 12v dc	Good Functionality
Supply water sensor (measured across two terminals)	5.0v dc	
Mixing valve actuator	25v to 27v ac between + and -	
Drive signal (the master shows the output in the “spanner” section of the display menu, this can be checked at the actuator terminals, across the blue and black cables).	0v to 10v dc	

12.0 RESETS



There are two different reset actions that can be used on the FS Master Controller:

Resets	To Enable	Function
Hard Reset* (used if there is a faulty sensor)	Press the " ✓ " button on the FS Master Controller for 5 seconds; a HARD RESET will be initiated (indicated by all the red output LED's (1-8) rapid lighting in sequence).	a) This reset will remove any Room Sensor unit with a defective input sensor, or a defective Add On Module from the system. b) The fault message will be reset, but the defective items will no longer participate in the system. Once a defective unit is replaced, the new unit will automatically be recognised by the FS Master Controller and become part of the system. c) This reset would erase the identity of the defective component from the Master Controller memory.
Factory Reset (restores factory defaults)	Press the " ✓ " button on the FS Master Controller for 15 seconds; a total factory reset will be initiated. This is indicated through flashes of channel LED's 1,3, 5 and 7 alternating with channel LED's 2, 4, 6 and 8 (while the " ✓ " button is pressed).	a) This reset will put all programmed temperature settings back to the factory defaults. b) It will also remove all Room Sensors/Controllers from the master memory, and reset the system to accept only those Room Sensors/ Controllers that are functioning correctly.

* Hard resets do not alter the temperature settings already programmed into the FS Master Controller.

12.1 Replacing Faulty Sensor/Controller

1. Identify the sensor/controller to be changed by the blinking output LED.
2. Switch OFF power to the master
3. Change the sensor/controller. Ensuring the correct channel address
4. Switch ON power to the master
5. Set the master into sensor check mode and set DIP-3 to ON.
6. On wireless sensor/controller now press the button on the sensor/ controller. On hardwired sensor/controller go to step
7. Check that the corresponding output LED has changed from blinking to permanently ON.
8. Reset the DIP-3 to OFF.

For any other changes in the system use the quick guide and start the install sequence from the beginning.

13.0 SENSOR FAILURE/VALVE AND PUMP EXERCISE

13.1 Sensor/Controller Failure

If a Room Sensor/Controller is defective or if the communication to the unit is interrupted, an alarm will be triggered. Depending on the system configuration the control will continue in one of the following ways.

- If there are several units on the same channel which have a room sensor (which is still intact), the control will continue as before, however without contribution from the defective unit
- If no valid Room Sensor/Controller is found, the system will run at constantly 20% ON
- If an outdoor sensor is connected, the system will run 40% at 10°C (and below) decreasing to 0% at 20°C (and above).

The emergency program is only valid for channels with heat control. Channels with cooling control will always run at 100% OFF in connection with a defective room sensor.

13.2 Emergency Program for Supply Limit Sensor

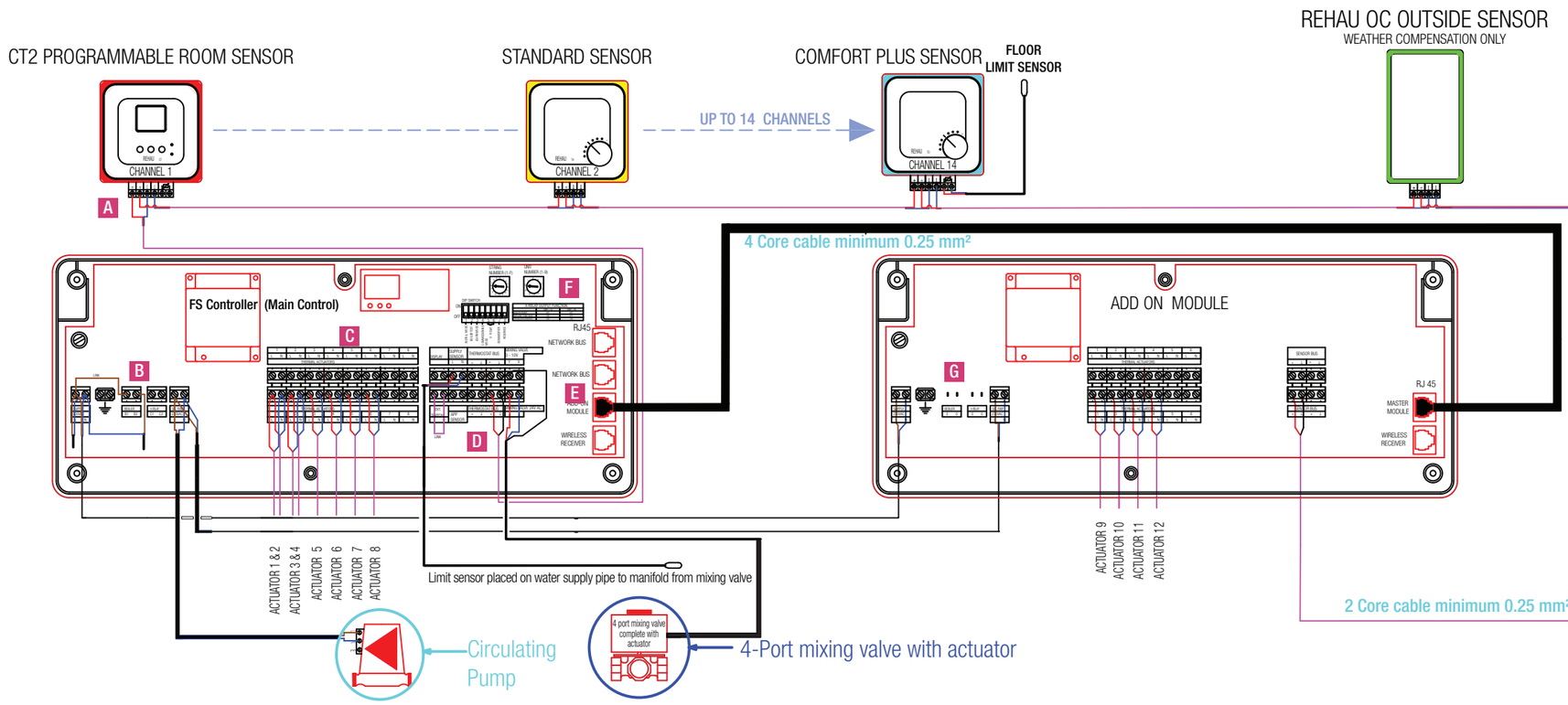
- If the supply limit sensor is defective, the system will run at constantly 20% on for the mixing valve.
- If an outdoor sensor is connected, the system will run 40% at 10°C (and below) decreasing to 0% at 20°C (and above).

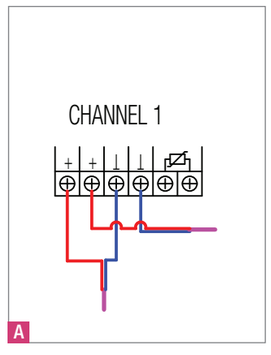
13.3 Valve and Pump Exercise

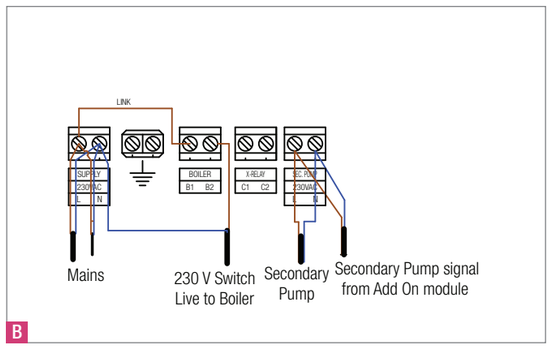
If no automatic ON/OFF sequence of valves, or pumps occurs over a 72 hour period, an exercise of these components will take place. The actuators will be activated for 3 minutes. The pumps will be started for 10 seconds during that period and the mixing valve actuator if fitted will be opened and closed. During this period there will be no firing of the boiler.

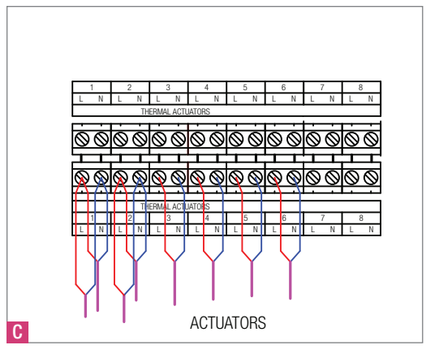
14.0 WIRING SCHEMATIC - NEXT GENERATION

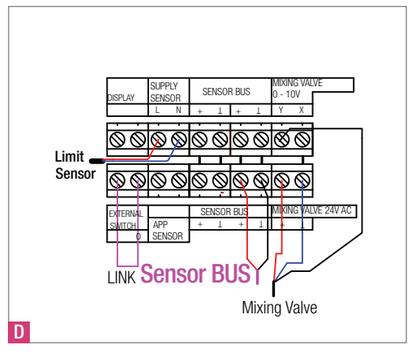
REHAU FS MASTER CONTROLLER WITH ADD ON MODULE

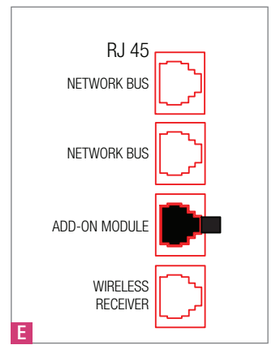


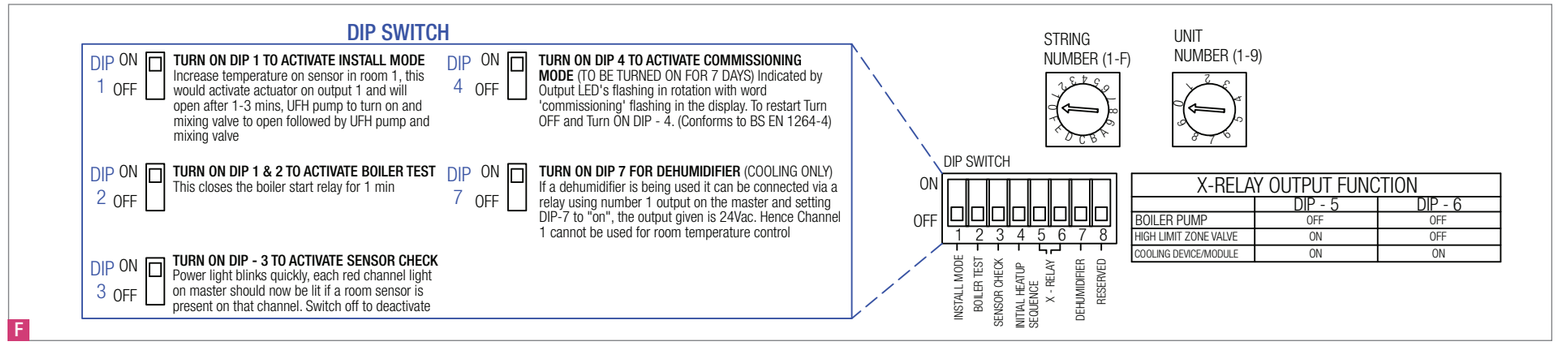


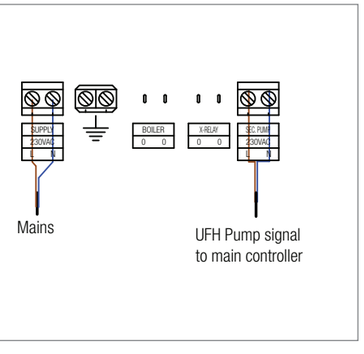









DIP SWITCH
DIP 1 ON OFF
TURN ON DIP 1 TO ACTIVATE INSTALL MODE
Increase temperature on sensor in room 1, this would activate actuator on output 1 and will open after 1-3 mins, UFH pump to turn on and mixing valve to open followed by UFH pump and mixing valve
DIP 2 ON OFF
TURN ON DIP 1 & 2 TO ACTIVATE BOILER TEST
This closes the boiler start relay for 1 min
DIP 3 ON OFF
TURN ON DIP - 3 TO ACTIVATE SENSOR CHECK
Power light blinks quickly, each red channel light on master should now be lit if a room sensor is present on that channel. Switch off to deactivate
DIP 4 ON OFF
TURN ON DIP 4 TO ACTIVATE COMMISSIONING MODE (TO BE TURNED ON FOR 7 DAYS) Indicated by Output LED's flashing in rotation with word 'commissioning' flashing in the display. To restart Turn OFF and Turn ON DIP - 4. (Conforms to BS EN 1264-4)
DIP 7 ON OFF
TURN ON DIP 7 FOR DEHUMIDIFIER (COOLING ONLY)
If a dehumidifier is being used it can be connected via a relay using number 1 output on the master and setting DIP-7 to "on", the output given is 24Vac. Hence Channel 1 cannot be used for room temperature control
STRING NUMBER (1-F)
UNIT NUMBER (1-9)
DIP SWITCH
ON
OFF
1 2 3 4 5 6 7 8
INSTALL MODE
BOILER TEST
SENSOR CHECK
INITIAL HEATUP SEQUENCE
X - RELAY
DEHUMIDIFIER
RESERVED
X-RELAY OUTPUT FUNCTION
DIP - 5
DIP - 6
BOILER PUMP OFF OFF
HIGH LIMIT ZONE VALVE ON OFF
COOLING DEVICE/MODULE ON ON
F



The schematic shown explains the typical/ basic wiring principle of the REHAU Intelligent controls. The number of Room Sensors / Add On Modules can differ for each project.

NOTES

1. Earth wiring not shown for drawing clarity.
2. All wiring and earthing to be in accordance with BS 7671:2002, I.E.E Regulations.
3. Secondary pump connection must be routed back to the secondary pump terminals within the FS Master Controller if only 1 manifold secondary pump is connected to the system. This is required to allow the pump to run should any actuator connected to the Add On Module be called to open.
4. 4 core cable with a minimum cross sectional area of 0.25mm² must be used to connect the Add On Modules to the FS Master Controllers.
5. 2 core cable with a minimum cross sectional area of 0.25mm² must be used for the thermostatic bus.
6. All sensor connected to the bus must terminate at the FS Master Controllers not at the Add On Modules.

The above wiring schematic is for guidance only and should not be used as definitive wiring diagram.

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UK & IRELAND SALES OFFICES

London
REHAU Ltd
The Building Centre
26 Store Street
London
WC1E 7BT

Tel: (0207) 580 6155
Fax: (0207) 307 8595

Slough
Units 5 J & K
Langley Business Centre
Station Road
Langley
Slough SL3 8DS

Tel: (01753) 588500
Fax: (01753) 588501

Birmingham
Tameside Drive
Holford Way
Witton
Birmingham
B6 7AY

Tel: (0121) 344 2300
Fax: (0121) 344 2301

Manchester
Brinell Drive
Irlam
Manchester
M44 5BL

Tel: (0161) 777 7400
Fax: (0161) 777 7401

Glasgow
Phoenix House
Phoenix Crescent
Strathclyde Business Park
Bellshill, North Lanarkshire
ML4 3NJ

Tel: (01698) 503700
Fax: (01698) 503701

Dublin
9 St. Johns Court
Business Park
Swords Road
Santry
Dublin 9

Tel: 00353 (0)1 8165020
Fax: 00353 (0)1 8165021